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ABSTRACT

The five issues of this journal, written mainly by and for academically talented youth, focus on the following themes: (1) environmental science, (2) the performing arts, (3) engineering, (4) cross-cultural studies, and (5) career discovery. Most of the articles were written by high school and college students. Each issue also includes lists of resources related to the theme, a book discussion focusing on a classic text, a vignette of a career area, a guide to planning for college, a theme-based crossword puzzle, student poetry, a student review of a college or university, and mathematical puzzles. (DB)

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Opportunities and Resources for Academically Talented Youth

Melissa E. Hartman, Ed.

Volume 6, Numbers 1-5

September/October 1998 - May/June 1999

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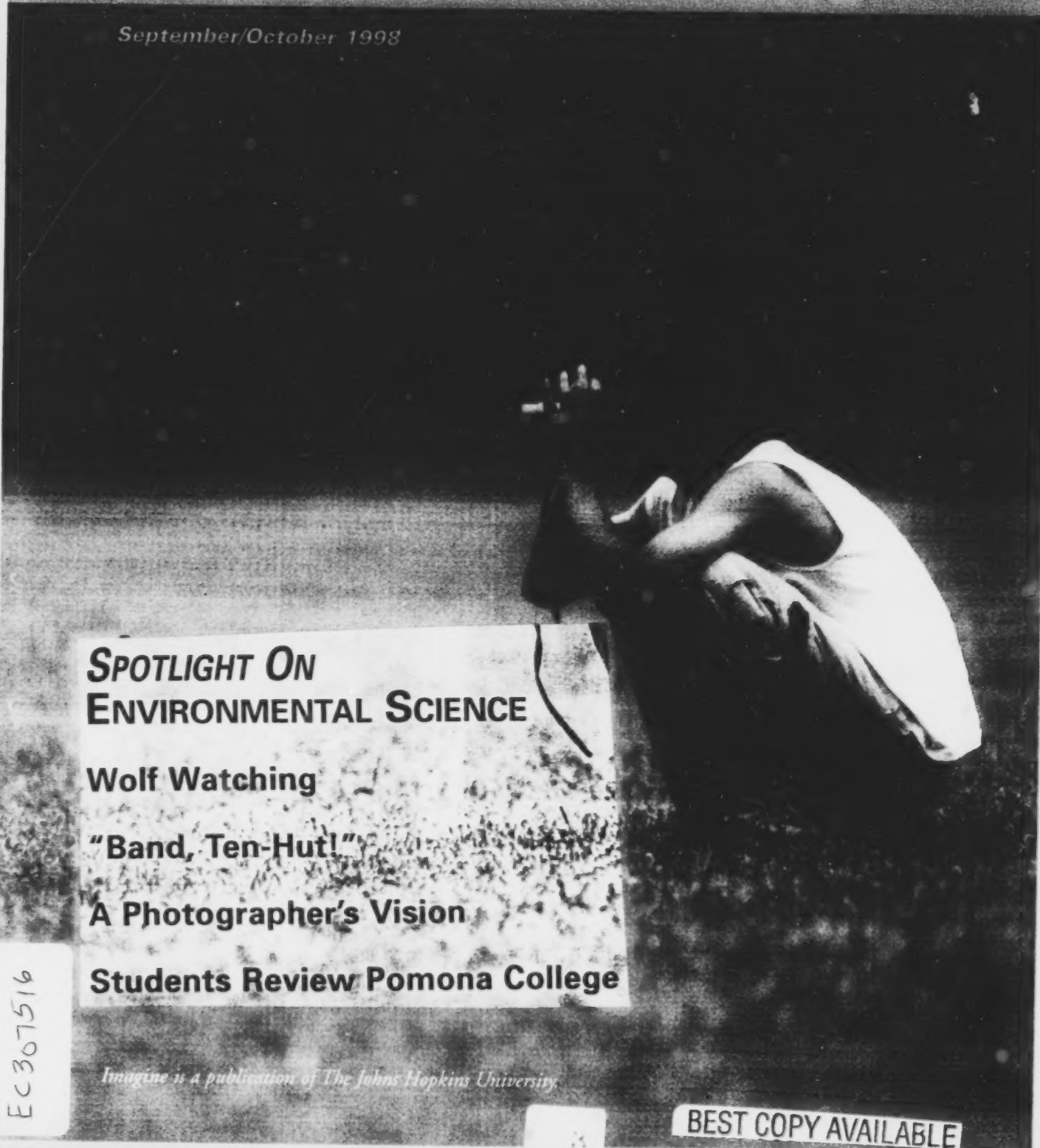
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ImaGiNe...

Opportunities and Resources for Academically Talented Youth

September/October 1998



SPOTLIGHT ON ENVIRONMENTAL SCIENCE

Wolf Watching

"Band, Ten-Hut!"

A Photographer's Vision

Students Review Pomona College

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Focus On: Environmental Science

WELCOME TO THE FALL! We hope you had a great summer and that you are excited about the new school year—and a new year of *Imagine*.

This issue focuses on the environmental sciences. Preparing it, we at *Imagine* often felt inspired. Surfing the Web, talking to teachers, and contacting organizations, we learned about countless young people who are studying the natural world or working to protect it.

A dozen of these energetic, creative students are featured in these pages. In their own words, they tell about cleaning up a beach, preventing the construction of a new housing development, bringing environmentalism to the Web, tracking timber wolves, diagnosing mistletoe infections, and cataloging a forest's birds. Their accounts are filled with humor, excitement, and passion. One thing we learned putting this issue together: saving the natural world may be important, but it's also a lot of fun. ☼

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On the cover: On land for now, this IAAY marine ecology student also conducted research aboard a whopper and in a lab. Photo by Cade Martin.

For information on IAAY marine ecology courses, see page 13.

Students Protecting the Planet

How Young Hearts and Minds Can Save the Planet

by Adam Werbach

At age 23, Adam Werbach was the youngest President in the history of the Sierra Club. After two years, he resigned to travel and talk to young people about how they can protect the places they live in and the places they love.

I never believed for a moment that because I was young I didn't have the power to change things for the better. In fact, I used my youth to bring about change. In my two years as President of the Sierra Club, the average age of our membership fell by a decade, and we saved places like the Kaparowtiz plateau in Utah, the American River in California, and the Sterling Forest in New Jersey.

Strangely enough, when you are trying to change things for the better, it's easy to feel apologetic. But I've learned that a little well-planned irreverence goes a long way. Feeling apologetic about advocating for change will not make the world a better place. Only action will.

Constructive action, that is. Unfortunately, some of us still act destructively toward the natural world. In 1998 90% of seals and sea lions born off the California coast will die in their first year of life, a result of catastrophic overfishing compounded by fierce El Niño storms. Not long ago, I flew to Los Angeles and helped release injured seals that had made good recoveries back into the ocean.

There are countless opportunities for us all to help heal and preserve the environment. As you take on this challenge in your own way, your youth will be your strength. Embrace it. Enjoy it. Explore it. And remember that you're not "just a kid." You have the tools to wield power. Do so compassionately, respectfully, and responsibly. The best way to honor the teachers and parents who have invested so much in you is to be a responsible citizen of the planet. 🌱

Protecting a Reservoir, Beautifying a Beach

by Qi Feng

Last summer I took part in a program called Summerbridge in Cambridge, Massachusetts. With centers in 100 cities, Summerbridge aims to prepare middle school kids for high school by combining the challenge of a tough academic program with the fun of a summer camp and the opportunity to perform community service.

On Mondays and Fridays, our group went to Fresh Pond, the principal water supplier for several communities in greater Boston. The ranger at Fresh Pond told me and my friends that a lot of erosion was taking place there, and that mud was contaminating the water. The problem was caused by people wandering off trails, disturbing the surrounding land, and thereby creating pathways for erosion.

To demonstrate what was happening, we conducted an experiment with coke bottles that had no caps and no bottoms. We secured the bottles at an angle; one contained only soil, but the rest contained a layer of pebbles, rocks, or mulch on top of a layer of soil. We put a cup below the wide end of each bottle and poured water into the narrow top. Water that trickled out from the bottle that contained only soil was very dirty, while water that first passed through the filtering substances came out almost as clean as the original water.

From our experiment, we found that mulch was the best substance for trapping and cleansing water. Mulching the trails that ran along the rivers flowing into Fresh Pond would not only make the trails beautiful, but would also make the water purer.

The next few days we made a 200-yard trail bordered by fallen tree stumps and covered it with mulch. Later, I was so glad to

read in a local newspaper that the water from Fresh Pond is now safe enough to provide bottled drinking water. I'm sure that our hard work paid off.

Our Summerbridge group also went to clean a beach near Boston, where many elderly people reside. The ocean view from the beach was great. The problem was the piles of bricks, brooms, bottles, seaweed, and dead fish, as well as the swarms of annoying mosquitos on the beach.

At first we were excited about cleaning up the mess, but after a couple of hours, it seemed as though the landscape was not really changing. Some of us got frustrated, but we thought about the people who



would enjoy the beach once we cleaned it up, which got us focused. By the end of the day, we had collected around 2,500 pounds of junk. A few weeks later, white sand was poured onto the beach, and the bricks we had found were made into a trail.

Today, when I go to that beautiful beach, I can still envision what it was like covered with trash the first time I was there. 🌱

Qi Feng is a ninth grader at Bryn Mawr School in Boston. He is interested in math, science, and the outdoors, and I thought he'd be a good fit for this article.

For more information on Summerbridge, see <http://summerbridge.stanford.edu/program.html> or call (415) 749-0237.

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Students Protecting the Planet

Where the Buffalo Roam

by Sarah Carter

At 5:30 on a hot July morning in 1997, I thought about my friends back home in Vermont who had a few more hours of sleep ahead of them. Already wide awake for a half hour, I was about to head into dewy South Dakota grassland with six new friends. We had all joined a "conservation work crew" without knowing what to expect. Most of us thought we would be spending the summer doing something that our parents believed was a good idea, something that might look good on a college application someday. But those five weeks turned out to be unforgettable.

The trip had been arranged by the Student Conservation Association, and our job was to reconstruct two miles of an overgrown trail through Wind Cave National Park, located north of Hot Springs, South Dakota. For two days we learned how to use tools with names like "pulaski" (similar to a pickaxe) and how to deal with the presence of rattlesnakes, buffalo, and ticks. Apparently rattlesnakes are more afraid of us than we are of them, and ticks just need to be removed, but buffalo are another thing altogether.



Throughout the trip, the impressive animals seemed to appear out of nowhere, with an unnerving habit of showing up behind me. Rangers advised us to keep an eye on them—and to keep our distance. "Buffalo can be unpredictable," they said. *Great, I'm thinking. Can I run in these boots? Can*

buffalo climb trees? Wait, there are no trees ... just grass! Well, I have my pulaski.

After several days at work, we grew more relaxed and fell into a rhythm on the trail: Dig a little, stand and talk a little, dig a little more. *Water break! Dig some more. Lunch break! We joked that some of the people who passed us must have wondered if we were a chain gang.*



One of the things I loved most about working in Wind Cave was getting to know the park rangers, who were among the most genuine and warm-hearted people I've known. After two weeks, a ranger named Glen invited us to his house for Kung Pao chicken and apple pie. After dinner, we sprawled on his front lawn for two hours, unable to move. *How am I going to lift that pulaski tomorrow?*

After completing work on the trail, we helped Glen with other projects, including a count of the elk in the park. But we really got to know him during his numerous trips to rescue our port-a-potty. Wind, our constant companion and only relief from the heat, toppled the structure daily. Finally, Glen swung thick ropes over the top and pinned it to the ground using eight-inch stakes. *We can't open the door, but that port-a-potty is never going down again!*

We also worked with Amy, a botanist trying to eradicate Canada thistle, a non-native plant that had invaded Wind Cave. She taught me more about field biology

than I ever learned in a classroom. She also shared her home, ice cream, and thoughts about Brad Pitt with me and my friend Jill.

We spent our last five days hiking through snow fields in the Big Horn mountain range across the border in Wyoming. At night we read stories and talked about our lives. We slept under a canopy of stars in the biggest sky I had ever seen.

The most valuable part of my experience was the friendships I made. Our crew couldn't have been a more diverse group; had we met in school, we might never have made the effort to get to know one another. But it was impossible to maintain a facade of "school cool" while living in tents, laughing constantly at (and with) each other, and working hard toward a common purpose. I got to know my crew better than I knew anyone outside my family. Best of all, we met not as the people we had been at our schools and homes, but as the people we wanted to be. 🌿

This summer Sarah Carter was caretaker and companion to an 87-year-old woman on Brown's Island near Ocracoke, Maine. A senior at Haverhill High School in New Hampshire, Sarah lives across the border in Vermont.

For information on Student Conservation Association programs, see page 13.

Students Protecting the Planet

Keeping the Planet Green: Environmental Preservation and the Power of Youth

by Eric Luedtke

Chapman's Forest—2,250 acres of woodland along the banks of the Potomac River in southern Maryland—is an almost untouched ecosystem prized by conservationists and environmentalists. This primeval forest is valued both as an irreplaceable natural resource and for its importance to the region: Mattawoman Creek, the major drainage basin of the forest, is one of the few remaining healthy creeks in the Chesapeake Bay watershed.

Several years ago the ecosystem's survival was threatened by plans to build a huge development in the forest that would be known as Chapman's Landing. According to the developers' plans, golf carts would scoot along an 18-hole course and lawn mowers would roar where massive trees now stand.

As news of the proposed development spread, a coalition of citizen groups united to preserve the forest. Among the most vehement—and loudest—supporters of preservation was a group of high school students, the Montgomery County Student Environmental Activists, or MCSEA. Founded in 1996 by a student at Wootton High School in Rockville, Maryland, MCSEA (pronounced mac-sec-uh) evolved from a cohort of students who campaigned to stop construction of an incinerator. Although the campaign was unsuccessful, it led to the county's first student-run organization for the environment. From a handful of activists at a single school, MCSEA has blossomed into a county-wide organization of more than 50 students from 13 different schools.

MCSEA was founded on the belief that there can be a balance between progress and preservation, that there is innate worth in the natural world, and that wanton human

destruction of forests, mountainsides, and oceans is wrong. The organization works to change attitudes toward the environment while protecting the small amount of green space left in Montgomery County. Our group is now well known among Maryland's environmental community, and interested students attend one or two actions a week, and a meeting or a hike every Saturday.

MCSEA became involved in the Chapman's battle two years ago. The power that students bring to the environmental movement is that we *are* students,



with a unique blend of energy, dedication, and intensity. We brought these qualities to dozens of actions on the Chapman's Forest issue.

In the summer of 1997 the US Army Corps of Engineers issued their permit for construction of Chapman's Landing. All that stood between the forest and development was one wetlands permit from the state of Maryland. In a frenzied summer of activism, MCSEAs played a major role in the push to convince Maryland Governor Parris Glendening to save Chapman's.

One of MCSEA's contributions was a phone-bank campaign in which students called hundreds of Maryland residents, asking them to call the governor's office and express support for the forest's preservation. The phone bank was so successful that a special receptionist and database were set up

in the governor's office to handle the flood of incoming calls.

MCSEA also created a flyer to educate the public about the issues in the conflict. Students handed out these flyers at intersections in Annapolis on five different days in July, asking motorists for their support. These grassroots efforts generated coverage for our campaign in area newspapers and eventually led to a short piece on CNN.

All the hard work paid off this spring when Governor Glendening pledged his support for the forest and agreed to have the state buy the property. Having convinced the governor, we needed to pressure the corporations that owned the property, the Norwegian firm Aker RGI and Woodbridge, Virginia-based developer Legend Properties, Inc., to accept the deal. MCSEA activists attended protests in front of the Norwegian embassy in Washington and at the Legend Properties annual shareholders meeting, which generated more press attention and further spread word about the issue.

At this writing, the agreement is still being worked out, but two years after MCSEA became involved in the campaign, Chapman's Forest is well on its way to being preserved forever.

Margaret Mead once said, "Never doubt that a small group of thoughtful, committed citizens can change the world; indeed it is the only thing that ever has." MCSEA was set up with that premise in mind, and we've already seen it happen. ❀

A senior at Thomas S. Wootton High School in Rockville, Maryland, Eric Luedtke has been active in environmental issues on the local, state, and national level for four years. He is Chair of the Maryland Sierra Student Coalition, regional coordinator for the national Sierra Student Coalition, and a MCSEA activist.

MCSEA is a member group of the Sierra Student Coalition. For information on SSC, see page 7. For MCSEA's Web site, see <http://notfoo.res.cmu.edu/~mcsea>

Students Protecting the Planet

Environmentalism Online: Setting Up Camp Internet

by Aquila Tyndall

Nowadays you don't need flippers and a wetsuit to explore the depths of the Pacific Ocean with a marine biologist. You don't even need to get wet. Thanks to waterproof cameras and video and audio streaming—whereby continuous pictures and sound are



transmitted in real time over the Internet—you can see live what a diver sees at the bottom of the ocean, hear an expert's narration, and even communicate with the diver from your computer, perhaps asking him or her to turn around for a better look at a kelp bed. Simply post a message online that someone in the diver's launch reads via remote Internet connection and relays to the diver using a headset.

This remarkable opportunity is the work of Camp Internet, a Web-based distance education project that started as a single list-serv in 1992. Students on the list-serv could chat online with "Trail Guides"—scientists and historians—and with each other. Today Camp Internet encompasses an array of educational sites that feature subjects ranging from astronomy and California history to creative writing, and students can go on interactive tours, like the virtual dive, with Trail Guides who may be scientists, historians, authors, or celebrities.

Three years ago I created my first Web site—a simple, two-page document. Today

I'm Webmaster for Camp Internet. In creating a multimedia site, I have learned to work with a variety of media, including short movies and digital artwork. I have also learned along the way that Web design is more than just HTML—it is creatively organizing and presenting information in a way that is easy for people to find and understand. Meeting this challenge is certainly the most important—and often hardest—part of my work.

I am currently updating the site for a pilot distance education program for the '98-'99 school year, which will focus on the Santa Barbara Channel Islands off the coast of southern California. The Channel's increasingly fragile environment boasts spectacular vistas, with rocky formations that lift straight out of the sea and long, mountainous islands that are seen but rarely touched. But its waters—site of a disastrous 1969 oil spill—are dotted with massive industrial platforms built for oil exploration, evidence of an ever-present environmental threat.

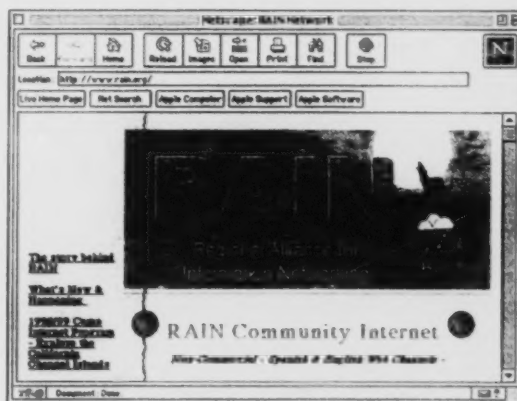
Its rare natural beauty and uncertain future make the Channel a rich and complex focus for online exploration. The Camp Internet program provides lessons on the local marine and terrestrial environments, as well as the history of the area and its inhabitants. Information and activities are customized for different ages, and they are accessible on a daily, weekly, or occasional basis.

More than 70 educational and environmental organizations from across the nation cooperated to develop Camp Internet's lessons, which are being used in 14 California school districts and are available to anyone with an Internet connection. Thanks to the

teamwork of so many organizations, Camp Internet—and I as Webmaster—have the opportunity to spread awareness about social and environmental issues.

The Internet is the most varied and comprehensive source of knowledge, as well as the most powerful medium for sharing a message with a large audience. The Internet's capacity to spread knowledge about the intricate ecological systems that sustain us makes it a vital tool for environmentalists. With this tool, I can help my generation gain the knowledge we need to create a sustainable society. ♻️

A freshman at Santa Barbara City College, Aquila Tyndall is highly concerned with environmental issues and united rights issues and hopes to spread as much awareness and change through the Internet as possible.



You can check out the Web sites Aquila created for RAIN (Regional Alliance for Information Network) at:

Camp Internet

www.rain.org/campinternet

Marine Educators Regional Alliance

www.rain.org/~mer

GreenNet

www.rain.org/greennet

California Aquatic Science Education Consortium

www.rain.org/casec

Scholarship Foundation of Santa Barbara

www.rain.org/sb-scholarship

Ocean Studies Center

www.rain.org/aoc

Environmental Organizations

There are many ways to become a steward of the Earth. You can join an established, multi-focused organization. You can take part in a single effort, such as the Earth Island Institute's Sea Turtle Restoration Project. Or you can start your own group with an emphasis on local, regional, or global concerns—and, if you choose, affiliate with an umbrella organization, such as the Sierra Student Coalition.

Your hometown, school, or region may support initiatives with or without ties to larger organizations. We can't tell you about those, but, below, we offer a sampler of well-known efforts.

Coalitions of Groups and Individuals

Sierra Student Coalition (SSC)

The student wing of the Sierra Club, the SSC offers membership to individuals and local groups, conducts campaigns, and provides resources, networking opportunities, and leadership training.

Call (401) 861-6012 or see www.ssc.org

The Student Environmental Action Coalition (SEAC)

SEAC is a grassroots coalition of student and youth groups with a strong record of taking action. Aiming "to uproot environmental injustices through action and education," SEAC has grown to incorporate 1,500 high school and college groups in all 50 states.

Call (919) 967-4600 or see www.seac.org

Rainforest Action Network (RAN)

Dedicated to saving rainforests and to protecting the human rights of forest inhabitants, RAN maintains extensive media and public education campaigns, lobbies corporations and governments, supports 150 action groups and 30,000 members, conducts research, and produces publications.

Call (415) 398-4404 or see www.ran.org

Large National or International Organizations

The Sierra Club

A progressive yet mainstream organization, the Sierra Club works to influence public policy, adopts local, regional, and international causes, and helps people enjoy the outdoors. With many publications and a

great Web site, the Sierra Club is also actively engaged in public education.

Call (415) 977-5780 or see www.sierraclub.org

Greenpeace

Greenpeace is a strongly activist organization dedicated to educating the public about environmental problems and mobilizing governments, groups, and individuals to support solutions. Greenpeace believes that "to stop environmental atrocities, direct, nonviolent action must be taken."

Call (202) 462-1177 or see www.greenpeaceusa.org

World Wildlife Fund (WWF)

WWF pursues three basic goals: protecting endangered species, saving endangered species, and addressing global threats. In 36 years WWF has sponsored more than 2,000 projects in 116 countries. Members support global initiatives and implement campaigns and letter-writing drives.

Call 202-293-3800 or see www.worldwildlife.org

National Audubon Society (NAS)

One of the oldest, largest, and most powerful nature appreciation and conservation organizations in the country, NAS works on a broad range of global environmental concerns, maintains wildlife sanctuaries, and coordinates local groups and regional education centers. The society also publishes field guides, educational materials, and periodicals.

Call (212) 979-3000 or see www.audubon.org

A Special Organization with a Focus on Projects

The Earth Island Institute

A decentralized support structure that assists individuals in developing program ideas, the Institute nurtures 30 initiatives worldwide, including the Preserve Appalachian Wilderness Network and the Sea Turtle Restoration Project. Some efforts are geared for young people. The quarterly *Earth Island Journal* has won numerous awards. The Institute's Web site contains 500 informative pages.

Call (415) 788-3666 or see www.earthisland.org



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(800) 548-1784.

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Wolf Watching at Earthwatch

by Timothy Warren

It was my second day spotting as an Earthwatch volunteer in Ely, Minnesota. All afternoon I had sat hidden by small trees about ten feet back from a long, straight section of a dirt road. From the reports of other volunteers who were tracking the position of the wolf, I knew that #428 rested in a clearing in the woods behind me. Every 15 minutes, radio updates from the trackers broke the silence of the woods, indicating that the wolf was hardly moving. But without warning, at 6 pm, the two-year-old ambled onto the road, looked toward me, and walked away on the straight stretch until she was out of sight. When I called the tracking van on the radio and said, "We have a wolf," my voice was shaking.

The summer after my sophomore year in high school, I joined an Earthwatch team and spent two weeks tracking timber wolves. Before Earthwatch I had known little about *Canis lupus* and even less about wildlife biology. I imagined that in this field knowledge was gained almost entirely through direct observation. Inclined toward mathematics, I had dismissed wildlife biology as a less than rigorous field.

But after half a day at Earthwatch, I realized my assumptions were false. Working on a research team led by Lori Schmidt and guided by Dr. David Mech, an eminent wolf biologist, I learned that quantitative data lay at the heart of our investigation. The Earthwatch volunteers used radio telemetry to determine a wolf's exact position over a day. This quantitative data formed the basis for any conclusions

that might be drawn. Scientists correlated wolves' movements with weather, car activity, and time of day—all without seeing a wolf. How wrong I had been about wildlife biology!

Of Signals, Foot Prints, and Spotting

Every day the Earthwatch team divided into three groups. A tracking group monitored and recorded radio signals emitted by two wolves and used a technique known as

team recorded the signals. The intersection of the directional paths recorded from each van indicated a wolf's approximate location.

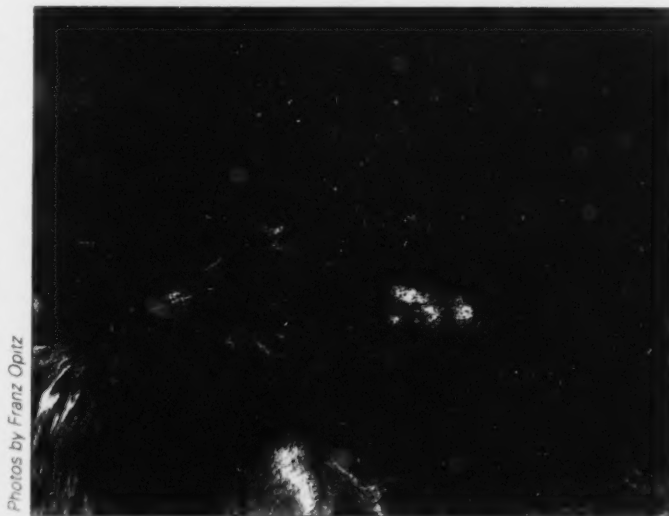
When I first operated the antenna, slowly twisting it around from inside the van and carefully listening on a headphone set, I mistook noisy static for the transmitter's trademark signal. I would soon learn to identify the true signal, a treble tone emitted about once a second. With this tone we obtained a location for the wolf every 15 minutes.

After a few days, I switched to the field research team, immersing myself in the woods and lake-sides that make up the wolves' landscape. To secure prints, we positioned wet plaster devices in areas of high wolf activity. The prints helped confirm the accuracy of our radio telemetry data, allowed us to make good estimates of a wolf's size, and provided us with neat memorabilia as well.

In the field, we also sought to determine wolves' precise den locations. Before leaving our base, we identified likely areas on a topographic map: sites that combine high elevation, for safety, with proximity to water, for nursing young.

When we located a den—I helped identify one in a marshy area next to a lake—we obtained its exact location with hand-held satellite GPS receivers, and photographed it for the record.

While spotting was easily the most thrilling of the three group activities, it was scientifically crucial as well. Spotting allowed the team to circumvent a weakness of the radio-telemetry technique, its inability to register and record the presence of uncollared companion wolves.



Photos by Franz Opitz

Canis lupus at the International Wolf Center, Ely, Minnesota

triangulation to identify their locations. A field group used this data to make indirect observations from clues such as paw prints and den sites. And spotters, members of the third group, positioned themselves so they might obtain "visuals"—glimpses of the collared wolves and any uncollared companions.

The two wolves we focused on, #428 and #75, wore radio collars that emitted a constant signal. Using two huge antennae mounted on top of our vans, named Gamma and White Scat, the triangulation



As spotters, we allowed the radio-trackers to identify positions where we would be likely to view a collared wolf in a non-invasive way. Spotting requires near-perfect communication between radio-trackers and spotters. In practice, spotting a wolf is rare. Very often, wolves change direction, avoiding the expected sighting altogether. Wolves' shyness around people is easy to understand. Hunting wolves has been outlawed in Minnesota for only 25 years. With much larger brains than any other canid, wolves make the wise decision to avoid humans.

Earthwatch in Retrospect

Three years after my Earthwatch experience, I am amazed and grateful that I ever found myself in Minnesota. Certainly, it is unusual for a high schooler, doctor, or sales-



Timothy Warren and Kevin Opler
during Earthwatch research.

person to be invited to join an active research effort. Earthwatch, based in Watertown, Massachusetts, dedicates itself to forging unorthodox links that permit curious laypeople to learn from and support the activities of scientists.

My experience researching wolves affected me in a very permanent, broad way. I gained a general understanding of how wolves act and of how researchers learn about wolves. More importantly, though, I gained an intrinsic interest in wolves, which I have pursued since my summer in Minnesota. Last year I wrote an extensive research paper on the possibility of restoring the wolf to its former Northeast habitat, in either Maine or New York. I explored the arguments for restoring wolves, and investigated whether it would be better to wait for wolves to resettle naturally or to reintroduce them ourselves, weighing the relative biological and social merits of the different approaches.

If it were not for my Earthwatch experience, I would never have conceived what turned out to be the most interesting project of my freshman year. In researching the possibilities of Northeastern restoration, I often relied on the opinions of Dr. David Mech, the lead investigator on my Earthwatch trip. Mech makes predictions about restoration based on data collected on northern Minnesota populations. I wonder if in some small way I helped to form the scientific opinions I later drew upon in my own research paper.

I fully expect that the image of a wild wolf ambling onto a winding road and my subsequent elation will remain with me for many years. More importantly, though, the Earthwatch trip has given me a context from which I can view environmental developments and a basis for pursuing questions of my own. 🐾

Timothy Warren has just finished his senior year at the University of Wisconsin. He is currently a member of the Earthwatch Institute. He is currently a member of the Earthwatch Institute.

For information on Earthwatch, see page 12.

The Resurgence of the North American Wolf

In 1973 the wolf population in the continental U.S. had fallen to a few hundred. But after 25 years on the endangered species list, wolves are 2,200 strong in Minnesota alone; smaller populations are holding on in Michigan, Wisconsin, Montana, Wyoming, and Idaho.

According to environmentalists, the resurgence didn't just happen. Ginny Ying-Ling, director of the Sierra Club's Minnesota chapter, commented to the Associated Press: "The recovery of the wolf in Minnesota may seem like a terrific success story. However, people should know the recovery of Minnesota's wolves was due largely to lawsuits brought by environmental groups to fight off repeated attempts by the state of Minnesota to open a sport hunting and trapping season on the wolves."

Keeping up with Endangered Species

The following electronic links can update you on the status of scores of irreplaceable living beings. Many also suggest activities in support of endangered species. You *can* make a difference.

To learn about species in the United States, see the U.S. Fish and Wildlife Service's Endangered Species Home Page
www.fws.gov/r9endspp/endspp.html

For more global information, see the World Conservation Monitoring Centre's Animals Database
www.wcmc.org.uk/data/database/rl_anml_combo.html

To find out about international conservation work, zoo populations, and activities and publications focused on preserving wildlife, check out the Conservation Breeding Specialist Group's site
www.cbsg.org/

Under a Protected Forest Canopy

by Meredith Alan



Our first walk through the forest was amazing and humbling. Huge trees loomed overhead, and deer, elk, squirrels, and birds thrived under the forest canopy we had come to study. Our group leaders used the Latin names for the trees as if we knew them too: "Mistletoe will not harm the *Pseudotsuga menziesii*, *Thuja plicata*, or *Taxus brevifolia*," they said. We entered the

infection, integrated ecosystems research, microclimates, and forest progression.

Our task was to expand the facility's permanent study area by one hectare, or two-and-a-half acres. To do this, we had to characterize each tree in the plot: identify its species; measure its height, location, and crown dimensions; and assess the extent of mistletoe infection. Dwarf mistletoe, a relative of the plant used decoratively at Christmas, is a tiny parasite that can kill some conifers. We learned to spot the dark swellings of mistletoe infection on the branches overhead. Comprehensive though it was, our work was only a step in the ongoing monitoring of the forest.

Looking up at the 65-meter trees is breathtaking, but to step onto a small platform, rise slowly from the familiar forest floor, and find yourself swaying above the immense canopy is awe-inspiring. From the ground, you cannot grasp the forest's vastness. From the crane, you see that the untouched wonderland you have been studying extends to the horizon, a living carpet of green, home to a host of species dependent on that very environment.

The precious nature of our forest became even more evident when we visited



Photo by Jiquan Chen

Meredith and another Earthwatch volunteer collect data.

forest, bewildered by their words. Two weeks later, we left the forest saying those words ourselves.

Along with seven other high school students, I came to the foothills of Washington's Cascade Mountains as an Earthwatch volunteer to help scientists at the Wind River Canopy Crane Facility (WRCCF) study a protected "old-growth" forest—a mature forest that has avoided devastation both natural and human. In this magnificent setting, there exists a balance of generations, from 450-year-old trees to seedlings just breaking ground. Here, we learned about firs and hemlocks, mistletoe

Surprisingly, the most unusual thing about the WRCCF is not natural, but man-made—a towering 83-meter crane, from which you can view the entire 450-acre forest. The tallest forest crane in the world and the only one in North America, it enables scientists to have three-dimensional access to a six-acre area. Suspended from the crane's arm is a gondola that can be lowered into the forest, allowing researchers to study the mid- and upper-canopies without disturbing wildlife. In keeping with the facility's charter to leave the forest undisturbed, the base of the crane was built in a barren patch, destroying as few trees as possible.



Photo by Al Levno, USDA Forest Service

A view from the crane. The gondola is visible hovering over the forest.

Holding Life in My Hands

by Molly Nixon



It seemed almost too good to be true: a chance to study tiny hummingbirds, colorful trogons, and other exotic birds in a cloud forest in Ecuador. But this is what Earthwatch enabled me to do—as a high school senior. During two of the most memorable weeks of my life, I helped catalog a cloud forest's avian biodiversity and worked alongside a conservationist who is aiding a local community to protect its forest resources.

After convincing my parents to let me go—perhaps the most difficult part of the process—I arrived in Ecuador on December 20th, the day after winter break began. I met my fellow Earthwatch volunteers and the principal investigator, Dr. Dusty Becker of Indiana University, and we headed for our home in the forest—a thatched-roof, bamboo shack without any modern conveniences—in the Colonche Mountains on the southwest coast of Ecuador.

Bathed in fog at least six months of the year, the Colonche Mountains sit atop a now arid coastal area. Once, both the lowlands and the mountains were forested; but over the past century, the lowlands were largely deforested, and the weather pattern changed. The denuded lowlands attract and trap little fog. The mountain forest is now the only ecosystem in the area that can capture significant amounts of moisture from the clouds. It supplies fresh water to the lowlands and is an oasis for wildlife during the dry season.

The fauna of the cloud forest is extraordinary. Howler monkeys call from above, and brilliantly colored birds dart through the trees, filling the air with their songs. It was,

but it contains more than 50% of the continent's bird species. The Colonche Mountains are home to a rich diversity of birds, including 18 species of hummingbirds. We arrived in the dry season, when the bird population is at its peak.

As volunteers, our primary job was to help mist-net (capture in fine netting), identify, measure, and photograph the forest birds. I had never before held a bird in my hands; soon, I was handling thrushes, hummingbirds, and tree creepers. It is a remarkable feeling to hold a tiny hummingbird no bigger than your thumb in the palm of your hand.

We Earthwatch volunteers stayed in the Loma Alta Ecological Reserve for only two weeks, but our group leader has made a long-term commitment to the area inhabitants—human as well as non-human. Dr. Becker has returned to Ecuador many times to monitor bird populations in the highlands and the lowlands, and in degraded as well as more pristine regions of the forest. At present, only 1% of Ecuador's original cloud forest remains intact. Over the past 50 years, trees have been cut for use as fuel and building material, as well as to expand the area used for farming and cattle grazing.

When she first came to Loma Alta, Dr. Becker found that the villagers, who hold



Photos by Tom Davis

Dr. Becker in the Loma Alta Reserve

in fact, the birds we were there to study—to catalog the resident species. Ecuador occupies less than 2% of South America,

Continued from page 10

Mount St. Helens just 35 miles away, where over a million old-growth trees were destroyed in a matter of minutes. In pictures taken before the eruption, the surrounding forests looked much like the one in which we worked. We walked amidst the still-charred landscape, seeing the ashen stumps of once great trees and the tiny shoots of what promised to tower again—if allowed to do so. The park's human visitors pose among the most serious threats to the recovering forest; a careless footstep can crush a new life. The visit deepened our appreciation of nature's awesome power while also impressing on us how vulnerable its regenerative processes can be.

Earthwatch and the WRCCF gave us not only the satisfaction of plotting our one hectare of forest, but also the chance to live in the midst of nature and to experience its magic. Standing beneath a towering canopy, surviving all kinds of weather in the shelter of its leaves and branches, learning to distinguish a mild mistletoe infection from a serious one, and watching a forest begin all over again, I developed a deeper sense of the complexity and intricate balance of nature.

I brought home priceless memories and an understanding that our world holds far greater treasures than most of us know. While many look for ways to exploit the earth's resources for profit, I now believe there is no greater reward than being able to see the sun rise over a centuries-old forest canopy. 🌿

Meredith Alan is a sophomore at Bucknell University where she is studying a dual master's degree in Environmental Science and Management. She intends to pursue a career in environmental education.

Continued from page 11

communal rights to the land, did not understand the cloud forest's importance to their village's survival. Without the forest to hold the soil during the wet season, water floods down the mountains, causing mud slides and destruction. And without the forest to trap fog in relatively dry years, the



Photo by Tom Davis

Molly visits a cloud forest orchid

water supply could disappear and force the villagers to move.

Since 1994, Dr. Becker, along with others at People Allied for Nature (PAN), a nonprofit organization she helped establish, has worked with the Loma Alta community to help them understand the value of their forest and develop plans to use the forest as a sustainable resource—to derive economic value from it without cutting it down. The

work we did—characterizing the rare birds of the region—is part of that plan: one day, the area may be a tourist destination for bird lovers. Dr. Becker and her colleagues have been so successful in their educational efforts that, two years ago, with the help of another group of Earthwatch volunteers, they convinced the community to establish the Loma Alta Ecological Reserve.

Being an Earthwatch volunteer was an unforgettable experience. I learned about bird identification, the cloud forest ecosystem, and the far-reaching effects of habitat degradation. I also came to appreciate how much knowledge, commitment, and good will are needed to make sustainable habitation of forests by humans possible. I left with a feeling of hope, determination, and a greater awareness that we are all holding life in our hands. 🌿

A sophomore at the University of North Carolina, Molly Nixon continued to learn about sustainable land management this summer as a Student Conservation Association volunteer at Merck Forest and Gardens Center in Rupert, Vermont.

Selected Resources

Becker, D. "The People's Choice," *EARTHWATCH Magazine* Nov/Dec 1996: 21-28.

EARTHWATCH

Earthwatch is an international, nonprofit organization that supports scientific research through its 4,000 annual volunteers, who work alongside scientists doing fieldwork and help underwrite the research expedition costs. The one- to three-week expeditions span seven interest areas, from endangered ecosystems and world health to archaeology.

Volunteers contribute to the field research and gain an experience-based understanding of how scientific advances are made and applied to solve global problems such as environmental sustainability.

Any student who is at least 16 years old and who meets the eligibility requirements for a specific expedition may join an Earthwatch research team.

Earthwatch also manages the Student Challenge Awards Program, in which selected teacher-nominated students gifted in the arts and humanities receive awards to join projects specifically developed for this program.

For more information, call (800) 776-0188 or visit the Earthwatch website: www.earthwatch.org

Environmental Programs

Johns Hopkins University's Institute for the Academic Advancement of Youth/Center for Academic Advancement (CAA) Marine Ecology Program

With the Living Classrooms Foundation of Maryland, the Southern California Marine Institute, and the Maritime Center of Excellence, the Institute offers students the opportunity to explore marine ecology at Baltimore and Long Beach. Courses are open to eligible students who have completed seventh, eighth, or ninth grade. Students master not only academic content and skills, but also aspects of camping, sailing, and snorkeling.

Site: Baltimore/ Chesapeake Bay

The Blue Crab

Students learn about the ecology, economics, and environmental issues relevant to the Chesapeake Bay while focusing on the physiology and habitat of the blue crab.

The Chesapeake Bay Oyster

Sailing, working alongside scientists in the field, and helping restore a sanctuary in the Patapsco River, students learn nautical skills and marine research.

Whales & Estuary Systems

Students sail on a schooner through bays, rivers, and sounds, from Baltimore to Gloucester, Massachusetts, and study the whales in Stellwagen Bank, one of the richest feeding grounds for whales in the North Atlantic.

Site: Long Beach

Project Ocean

Students explore marine biology, oceanography, coastal management, geology, and terrestrial ecology, and visit aquaria, wetlands, and islands.

To learn more about the Institute's opportunities in the environmental sciences and across the liberal arts, call (410) 516-0277, email iaay.programsinfo@jhu.edu, or see www.jhu.edu/~gifted

National 4-H Council's Environmental Stewardship Program

4-H provides students the opportunity to collaborate with community leaders in developing creative solutions to tough environmental challenges. The program integrates a science-based curriculum, research, planning, and community action.

For more information, write to National 4-H Council, Environmental Stewardship Program, 7100 Connecticut Avenue, Chevy Chase, MD 20815, or see www.fourhcouncil.edu/wenvtop.htm

Science at Sea Education Association (SEA), Woods Hole, Massachusetts

For high school students ages 15-18, SEA summer programs focus on the coastal and offshore marine environment around Cape Cod. Students live and study at SEA's Woods Hole campus and onboard a sailing research vessel. Courses include *Introduction to Oceanography*, *Introduction to Nautical Science*, and *Introduction to Maritime Studies*. For more information, call (800) 552-3633 ext. 770 or see www.sea.edu

Duke University's Talent Identification Program (TIP) Summer Scientific Field Studies

For students in grades nine through twelve, TIP offers rich educational experiences in adventurous settings. Courses include *Tropical Ecology in Costa Rica*, *Rocky Mountain Ecology and Biology*, *Appalachian Mountain Ecology, Biology and Botany*, and *Archaeology and Geology in the Southwest*. Call (919) 684-3847 or see www.tip.duke.edu/programs/sfs/

Student Conservation Association (SCA)

Wilderness Work Skills Program, High School Conservation Work Crew Program, and Conservation Career Development Program

SCA Programs offer students opportunities to study ecological issues, take part in communities, and implement conservation initiatives. For more information, call (603) 543-1700 or see www.sca-inc.org

Outdoor Education Programs

Hulbert Voyageurs Youth Wilderness Trips

Middle and high school students master navigation by map and compass, as well as open-fire cooking, while learning to kayak, rock climb, canoe, or backpack in New England wilderness. Call (802) 333-3405 or see www.alohafoundation.org

National Outdoor Leadership School (NOLS)

From sea kayaking in Alaska to mountaineering in Wyoming, NOLS courses teach leadership and wilderness skills. Participants explore the wilds without leaving a trace. Scholarships available. Call (307) 332-6973 or see www.nols.edu

Outward Bound

Courses emphasize self-reliance and teamwork on adventures such as sailing in the Florida Keys or whitewater rafting on the Colorado River. Scholarships available. Call (888) 88-BOUND or see www.outwardbound.org



And how about ... preparing for the new Advanced Placement Exam in Environmental Science? For information, call (888) CALL-4-AP or see www.collegeboard.org

Being Part of the

by Carol Blackburn



But the process creates a residue—known as “bottom ash”—that contains elevated levels of heavy metals. The hot issue became: what to do with the ash?

Eager to become involved, Jonathan linked up with environmental engineers at SUNY-Stony Brook's Waste Management Institute. They were examining the feasibility of using asphalt as a disposal medium—replacing asphalt's sand and gravel with bottom ash. “Scientifically, the project wasn't that complex,” Jonathan recalls. “We had to determine whether harmful materials could escape from ASHphalt—that's what we named it—through leaching or runoff. The complicated part was outside the lab. I never realized how many people would have to approve or help us with our work.”

All in all, Jonathan collected over \$100,000 of materials and services in order to complete the project. A local waste management company donated the bottom ash. Another company made the ASHphalt “test pucks” needed for the laboratory analyses. Once the WMI team was confident of ASHphalt's safety, they still had to determine whether it met commercial standards. For that, they needed to pave a test strip. And for that, they needed permission from the state Department of Environmental Conservation—and someone willing to put an ASHphalt test strip on their property.

Jonathan suggested his high school. “They were enthusiastic about the idea, and even helped us obtain the necessary permits.” Two years later, the test patch is still being monitored by WMI engineers and Ward Melville High School students. “I am proud to have been a part of this project,” Jonathan reflects. “We added a useful tool to the waste management arsenal.”

The environmental problems we face are daunting. But as these stories show, there are many ways to be part of the solution. ☼

Like a complex ecosystem, environmental science has many niches. Some people are drawn to study wildlife and wild places. Others view the altered landscapes around them and wonder how to lighten our footprint upon the land. Here are stories of three students—all Science Talent Search (STS) finalists—who did more than wonder.

Clean Up the Mess

Growing up in New Mexico, home of the first nuclear explosion, 1998 STS finalist **Stephanie Levine** developed a long-standing interest in radioactive waste. When she learned that a microorganism—*Deinococcus radiodurans*—can tolerate exposure to high levels of radiation, she started thinking about putting it to work.

The use of biological organisms to clean up human messes is known as *bioremediation*. Today microorganisms are used, for example, to metabolize spilled oil into less harmful compounds. Some pollutants, like uranium, can't be metabolically detoxified; but they can be ingested or absorbed—accumulated—by organisms, which can then be harvested and safely disposed of.

Stephanie tested *Deinococcus*' capacity to clean uranium-spiked water, but was disappointed at how little metal it could remove. Then she tried using a mixture of three heavy-metal-tolerant microorganisms and was delighted to find that the trio removed more uranium than did any one alone. She hasn't yet studied her microbial troika enough to know *how* they're doing what they're doing, but she's excited about the future of bioremediation, “especially the use of synergistic combinations of microorganisms.”

Clean It Before It Makes a Mess

1998 STS finalist **Calvin Huang** took a different tack. He wondered whether existing energy-generating technologies could be made cleaner with a minimum of expense and bother. The son of an environmental

engineer, Calvin understood how costly it is for industries to modify their facilities. He wanted to make it easy for power plants to clean up their act.

Coal-burning plants produce two trouble-making emissions: carbon dioxide, a greenhouse gas, and sulfur dioxide, a precursor to acid rain. CO₂ is an unavoidable product of fossil fuel combustion, but SO₂ is not. It's produced by contaminants in coal. So why not get rid of the sulfur before burning the coal? Calvin was not the first person to ask this question. Desulfurization processes have been studied, but all have been deemed too costly to adopt. Calvin hoped to devise one that wasn't.

At a nearby Wilmington, Delaware, power plant, Calvin learned that before coal is burned, it's pulverized and rinsed with water. So, working with pulverized coal in water, he tested a variety of procedures until he found one that removes sulfur from coal at room temperature—gently enough to preserve the heat value of the coal. “No power plants have tried to implement my desulfurization process yet,” Calvin admits, “but I'm hopeful. It could be easily installed and inexpensively operated. I'm optimistic that this sort of preventive approach to pollution control will become more common.”

Safely Stash What Can't Be Cleaned

In the 1980s, residents of **Jonathan Plaue's** native Long Island were shocked to discover that their groundwater was contaminated by seepage from landfills on their sandy-soil island. By 1990 Long Island's landfills were closed to prevent further groundwater contamination. Communities had to do something different with their trash. That was the beginning of a three-year adventure for this 1997 STS finalist—one he says was “at least as much a political as a science project.”

Many communities decided on waste-to-energy combustion as the best solution: it got rid of the trash and generated energy.

Print and Electronic Resources

Basics of Environmental Study

by Michael Allaby

Routledge Press, 1997.

An accessible introduction to the environmental sciences with tables, graphs, drawings, and clear description and analysis.

State of the World:

A Worldwatch Institute Report on Progress Toward a Sustainable Society

W.W. Norton, annual.

Considered "one of the most respected guides to the health of the planet."

The Diversity of Life

by Edward O. Wilson

Harvard University Press, 1992.

"An eloquent introduction to species diversity." The author is a celebrated entomologist and winner of the Pulitzer Prize.

Life in the Balance:

Humanity and the Biodiversity Crisis

by Niles Eldredge

Princeton University Press, 1998.

Eldredge argues that the Earth is in crisis because species are dying out at an unnaturally rapid pace and demonstrates the importance of maintaining biodiversity.

Guns, Germs, and Steel:

The Fate of Human Societies

by Jared Diamond

W.W. Norton, 1997.

A Pulitzer-Prize-winning exploration of the effects of regional biodiversity on human history.

Education for the Earth:

A Guide to Top Environmental Studies Programs

Sponsored by Alliance for Environmental Education. Peterson's Guides, 1993.

Comprehensive descriptions of undergraduate programs as well as perspectives on job trends.

Environmental Career Directory:

A Practical, One-Stop Guide to Getting a Job in Preserving the Environment

Career Advisor series, Visible Ink Press, 1993.

This guide can help you obtain an environmental internship or job. Recommended for high school and college students.

My First Summer in the Sierra

by John Muir

Penguin Nature Classics, first published 1911.

Muir, a renowned naturalist, founded the Sierra Club. This book recounts his rapturous, detailed investigation of the Sierra Mountains.

A Sand County Almanac

by Aldo Leopold

Ballantine Books, first published 1949.

A sequence of short vignettes on the American landscape. Leopold's loving account expresses all that the land can be to human inhabitants and travelers.

The Unsettling of America: Culture and Agriculture

by Wendell Berry

Sierra Club Books, first published 1977.

This classic carries a hopeful message: 20th century Americans can overcome their estrangement from the land by developing spiritually and supporting "good farming."

Savages

by Joe Kane

Vintage Press, 1996.

Kane reports on the battle over land and cultural rights in the Amazon, suggesting that Indians, oil executives, and environmentalists are more deeply at odds than even they imagine.

New and Selected Poems

by Mary Oliver

Beacon Press, 1993.

This collection of intimate poems about nature is a National Book Award winner.

Electronic Resources

The natural world has a true friend in the Internet, where activists, conservationists, and weekend warriors share environmental resources. Here are some guideposts.

A Guide to Environmental Resources on the Internet
www-personal.si.umich.edu/~cbriggs/environ_murphybriggs2.html

A comprehensive listing of organizations, networks, listservs, and Web sites on 16 environmental topics as well as databases, agencies, and online catalogs available by telnet and gopher.

EcoNet

www.igc.org/igc/econet or (415) 561-6100

A highly comprehensive, commercial online service with hundreds of electronic conferences.

EE-Link

eelink.net/students

Includes resources designed specifically for precollege students and links to college and university environmental programs.

The EnviroLink Network

www.envirolink.org

One of the world's largest environmental information clearinghouses.

Finally, check out the **Environmental Protection Agency's 25th Anniversary Report**
www.epa.gov/oppe/25year/ 🌱

Like Greased Lightning, Musicians Storm the Field

by Jay Parker

Marching is something that takes a minute to learn and a lifetime to master. Each time you think you've got it down, a new twist is added: backwards marching; "slides," where your body faces one way and your feet move another; and the dreaded "glide-step breakdown," which involves separating beats into four parts and analyzing where your body should be during each one. When you think you've finally mastered these skills, you're expected, incredibly, to play music at the same time.

At Richmond Hill High School, marching season begins with band camp in early August. I have been part of the band program since the fifth grade, but my first day at band camp in the August of my freshman year was still a shock. I was introduced to a whole new skill, complete with its own vocabulary, gestures, and way of moving.

Musically, marching band is not very complex. Most of the music is quite simple compared to the pieces we play during concert season, so perhaps the biggest challenge musically is memorizing the songs so that you don't have to use sheet music on the field. The real test comes when you play and march at the same time. It's easy to pay too much attention to marching and forget to play, or to concentrate too hard on the music and run into someone. The best marchers can play their music almost without thinking and are able to focus on their movements and what those around them are doing.

Welcome to the Show

During our week at Georgia Southwestern State University, we learned "the show" for the season. Our competition show,

which we also performed at most games, was based around the movie-musical *Grease* and featured six songs: "Summer Nights," "Beauty School Dropout," "Greased Lightning," "Born to Handjive," "Blue Moon," and the finale, "We Go Together." There were several high points in this show—the car formation in "Greased Lightning," a rotating moon during "Blue Moon," and the choreographed handjive. We also prepared a couple of fairly simple shows throughout the year to perform at home games, one with a Spanish theme and another based around music from James Bond films, *Jurassic Park*, and *Mission: Impossible*.



At band camp, days begin at 7:00 a.m. with stretching and exercises outside. After breakfast, we spend the morning rehearsing the marching part of the show, determining where we should be during each set, and making sure we know how to move correctly between sets. Mornings conclude with a "drilldown" in which band members compete with one another in following commands correctly and quickly.

Afternoons are devoted to indoor rehearsals of the music, usually by section. Here, we memorize music, practice solos

and ensemble parts, and discuss any changes to the sheet music, like omitting a part or repeating a section. After several hours of free time and dinner, marching practice resumes, usually with instruments, and goes until 10:00 p.m. We might play a quick game before turning in. Band camp certainly isn't all work: there is a game room and Olympic-size swimming pool on campus, and we put on a talent show the night before we return home.

From the Side Lines to Center Stage

Practice doesn't end at band camp. During the fall season, we spend five hours a week practicing after school in addition to our regular class time every day. Of course, the purpose of all this practice is to prepare for our first performance at the opening game of football season. At games we play the fight song, "Washington and Lee Swing," as the team bursts through a paper banner and takes the field. Then we sit back and watch, playing after touchdowns and field goals, during timeouts, and at breaks between periods. We play a variety of music, from the ever-popular "Hey Song" to 60s and 70s selections to more modern hits like "Iron Man" and "Vehicle." We must be careful not to play when the ball is in the area of the field near us, as doing so could distract the teams.

Midway through the second quarter we prepare to take the field. Perhaps a little nervous, we warm up for several minutes, put on our hats, and line up in our appointed positions. When the cadence begins and the whistle blows, we march onto the field, perform the show we've prepared over the last month, and exit quickly

"Band, Ten-Hut!"

by Kate Knuth

to enjoy the other band's performance and a break during the third quarter.

Even more exciting than the games are the competitions. At a football game the band's a sideshow, but bands take center stage at marching competitions. Last year we traveled to competitions in Panama City Beach, Florida, and in nearby Waycross, Georgia. Although we didn't place at Panama City, we came in second in our division at Waycross. We may add details at the competitions, like entering the field in a different way or yelling a slogan. (This year we chanted "Go Greased Light-ning," with each section coming to attention as it spoke its syllable.) The competitions provide an opportunity for us to meet other band members and make new friends, to watch and learn from other bands' performances, and to travel and experience a new environment for a day or two.

When the Music Stops...

Perhaps the most important aspect of marching band is the many friends you make. A typical high school freshman might meet only a few people from different classes and not get to know any of them well. Band instantly introduces you to more than a hundred new people, and allows you to develop rewarding friendships with people from other grades, most of whom you would probably never meet otherwise. Knowing older students with similar interests can be very helpful during one's first few months at a new school, and many of these friendships will endure long after you put down your horn for the last time.

As I write this, I'm impatiently waiting for marching season to begin in a month or so. I know it will be hard work, but when you're sitting in the stands playing the fight song after your team scores or waiting to hear the results of a competition, you know it's all worth it. ■

Last year Jay Parker was named Richmond Hill Marching Band's "Rookie of the Year." After spending the summer with his grandparents in Nova Scotia, Canada, he returned to Georgia for another season of band and his sophomore year at Richmond Hill High School.

It is 8:50 on a school night, and I've spent the last three hours on a football field with 150 other students practicing our marching band field show. It is dark and cold and I'm exhausted, but the next ten minutes will be the best of my day. I raise my arms to conduct the last run-through for the night, and when the final chord sounds, I know it was one of our best shows yet. And the performance wasn't for a huge audience, or even for the few parents present—it was for us.

I joined the Irondale High School Marching Knights my freshman year as an alto saxophone player. Since the spring of my junior year, I have served as one of two drum majors who lead the band by conducting music and calling commands.

Marching band begins each spring and runs through the fall. I remember watching rookies in April as they struggled to master exercises like "eights and eights," in which the band marks time for eight counts, marches for eight counts, then repeats this pattern. Drum majors and band staff work closely with new members, explaining exercises that we rehearse literally hundreds of times, until it almost seems like we can do them in our sleep. By June the entire band is ready to perform, and for the next two months we march almost every weekend at local parades throughout Minnesota.

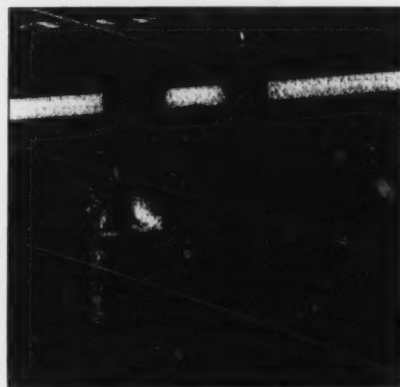
In August the band's focus shifts from parades to the field show we perform in the fall at football games and competitions. In our field show, we march over 60 sets, or field locations, while playing college-level music. We begin working on the show the first week in August at our annual band camp. The whole band travels to a college campus for one week, and we learn drill, or movement on the field, rehearse music, and integrate the two.

Last year's band camp, my first as drum major, was one of the hardest weeks of my life. My new responsibilities challenged me like nothing else ever had. Without any conducting experience, I had to learn to conduct a piece of music from memory that many band directors would have found challenging. I also had to find ways to motivate my 150 peers to repeat over and over the same 16 counts in sweltering heat.

Although stressful, the week was a highlight of the season, mainly because of the spontaneous, fun things we did to stay sane.

With a solid base from band camp, we spent August polishing the show. We seemed a little rusty at our first football game in early September, but we nailed our show at a competition the following week. After the awards ceremony I turned to my fellow drum major and received a huge hug, the start of a tradition.

Our season culminated in St. Louis at a Bands of America regional competition in the TWA Dome. Since Irondale had never competed at that level, we went to the competition with no expectations and were ecstatic when we made the finals. I can still see the anticipation on the faces of my friends just before we marched onto the field for our finals show, ready to perform better than we ever had.



Drum majors Kate Knuth and Eric Meriman at Bands of America

I was literally shaking after the last, long note was held and released. We circled up outside the building one final time. Drizzle mixed with a few tears on my cheeks as I looked around at my friends. My mind returned to the show, and I realized that for ten minutes we had owned the TWA Dome—ten minutes we would remember forever. ■

Kate Knuth is a senior at Irondale High School in New Brighton, Minnesota. This fall she will once again be leading the Irondale Marching Knights, whose field show will feature the music of American composer Leonard Bernstein.

Envirothon: I Took the Natural Challenge

by Timothy A. Jacobs

A girl stands waist deep in a pit dug into the ground. "Notice the mottling at only five inches?" she asks. "This soil is definitely poorly drained." Minutes later a boy examines a small amphibian. "Judging from the orange color," he explains, "and from the small red spots, I would have to say red eft."

Challenges such as these are posed regularly at the Envirothon, an environmental competition in which teams of five high school students compete at three levels: county, state, and national. In its eleventh year nationally, the competition tests students' knowledge of five subject areas: soils, forestry, wildlife, aquatics, and an environmental issue that changes each year. This year's is watersheds.

In 1996 I competed with the team from Pennsylvania at the National Envirothon, held that year in Nebraska at the Eugene Mahoney and Platte River State Parks. Just getting there was an adventure for me—I was in an airplane for the first time. Even the beautiful panoramas from above didn't prepare me for the beauty that I was to see from the ground. The open prairie is an awesome sight for a boy from Pennsylvania. I had never seen that much flat, open land before.

The National Envirothon is a week-long event that includes two days of competitions. The week begins with a day of station testing in the five subject areas. Station testing includes questions about the host site's environment. Some of the forestry test dealt with tree measurement and identification, which we had done in Pennsylvania. Other parts, however, dealt with prairie grass identification, which was unfamiliar to our team: none of us had ever been to a prairie, and reading about grasses was not the same as seeing them.

The next two days were spent learning about and communing with nature. One of the highlights was riding down the mighty

Missouri in a three-story riverboat and listening to speakers explain the environmental effects of the Missouri's channelization. They noted, for example, how the straightening and deepening of the river made it better for shipping but had destroyed fish habitat.

The riverboat ride was not just for fun. It was also to prepare us for the presentations we would make on the current environmental issue, greenways. On the third day, teams were given the task of developing a plan for a greenway—environmentally sound trails and improvements—along the Missouri River. Our entire team was locked in our cabin and watched by a chaperone for nearly ten hours as we prepared our speeches.

We presented our recommendations before an expert panel of judges the next day, and Pennsylvania was one of five finalists. Our team presented one last time, detailing exactly what our plan would do.

We would create a forest buffer inside the levee to help control flooding and prevent erosion. Trails would be constructed so that Nebraskans could enjoy the beauty of the levee. Above the study area, we would build artificial streams for fish reproduction. This plan would do it all.

The awards dinner would tell which state team had won. I hoped and prayed that Pennsylvania would finish first, but that year it was not meant to be. Although we did well in our presentation and had the highest wildlife score, we came in third—a good finish, but we could have done better. We left with a vow to return and claim victory.

Timothy A. Jacobs was captain of the Pennsylvania team that won the 1997 National Envirothon held in Johnstown, Pennsylvania. In July he competed at the 1998 championship in Lansing, Michigan. Tim is a freshman at Alfred University where he is majoring in mathematics and computer science.



Checking soil pH at the Maryland Envirothon

TEST YOUR KNOWLEDGE!

Envirothon prepares students to answer real-world environmental questions like these:

- Which of the following would not be a limiting factor for a home site with a basement?
 - poorly drained soils
 - soils with even and consistent soil size
 - light textured soils
 - heavy textured soils
- A rare form of aquatic life is discovered in the creek. As property manager, which of the following steps could you take to protect it from chemicals used in the Integrated Pest Management plan for the ballfield?
 - treat fields prior to heavy rain so all runoff is washed out of this section of the creek
 - treat field with additives that promote microbial activity
 - adjust pH of field so chemicals won't bond with soil and leach into groundwater supply
 - watch local weather patterns to apply chemicals during peak growth periods

ANSWERS:

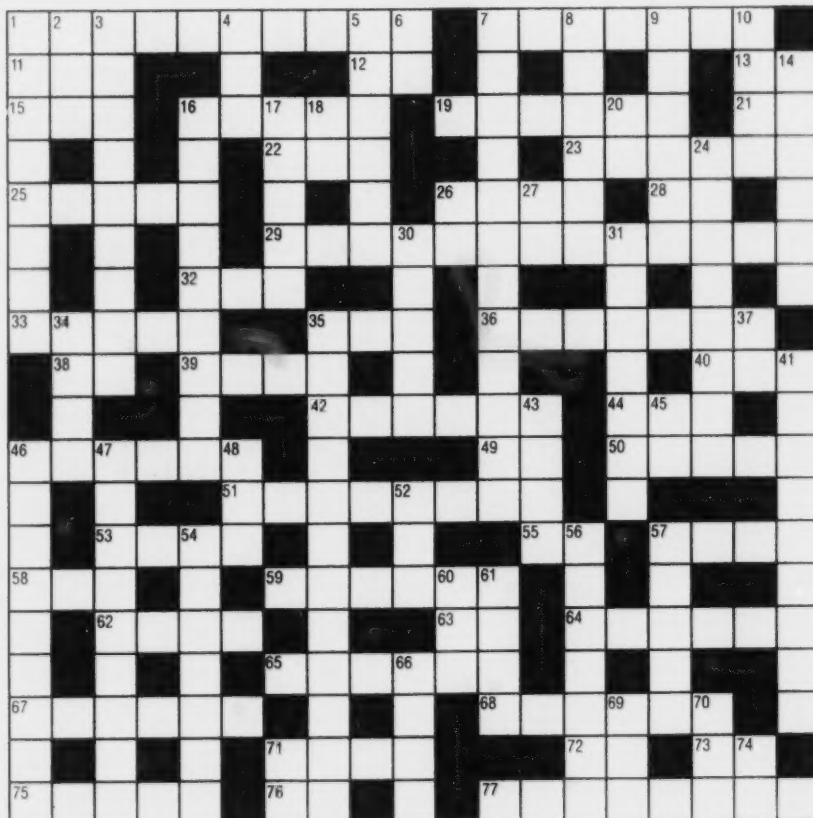
1.C 2.B

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National Envirothon, sponsored by Canon U.S.A., is the largest high school environmental education competition. For information, call (800) 825-5547 x27, or visit [www.envirothon.org](http://www.envirothon.org)

# WORD WISE

by Carol Blackburn

## Environmental Science



Constructed using Crossword Weaver

### ACROSS

- 1 Bane of Oregonian loggers (2 wds.)
- 7 Redwood tree
- 11 78% nitrogen
- 12 Atop
- 13 Chlorine (abbr.)
- 15 Messenger or transfer
- 16 Flower
- 19 Naval fleet
- 21 Providence locale
- 22 Ursa minor
- 23 Metallic element
- 25 An undesirable bloom
- 26 Immediately, in the ER
- 28 City of Angels

- 29 Caused by humans
- 32 Billion years
- 33 Japanese city
- 35 Ocean (Fr.)
- 36 Pouch-billed bird
- 38 Natural logarithm (abbr.)
- 39 Goddess of the Earth
- 40 Gnawer
- 42 Abnormal growth
- 44 Animal (Gk.)
- 46 Young swan
- 49 Hawk-headed sun god
- 50 Kings of the savanna
- 51 Imperil
- 53 Ear
- 55 Kind of engineer (abbr.)
- 57 Largest continent

- 58 Medical organization
- 59 World's largest river
- 62 Goddess of volcanos
- 63 Caesar's six
- 64 South Pacific island
- 65 World's deepest lake
- 67 Capt. Picard's command
- 68 Big "Little Boy"
- 71 Sierra Club founder
- 72 Centiliter (abbr.)
- 73 Mount Rainier state
- 75 Goes without food
- 76 Great Salt Lake state
- 77 Fens

### DOWN

- 1 Floating seaweed
- 2 \_\_\_ worm or \_\_\_ oak
- 3 Sumatran primate
- 4 Moray
- 5 Endangered marsupial
- 6 Natural logarithm (abbr.)
- 7 Ozone-rich layer
- 8 How much? (Ital.)
- 9 Prophet
- 10 Land unit
- 14 Flowering shrubs
- 16 Endangered raptor (2 wds.)
- 17 70% of earth's surface
- 18 Where? (Fr.)
- 20 Double (prefix)
- 24 Surly marsupial
- 26 Strontium (abbr.)
- 27 Challenging course
- 30 Egret
- 31 Bear
- 34 Kill
- 35 Australian native (2 wds.)
- 37 Sodium (abbr.)
- 41 Marsupial "tiger"
- 43 Scarce
- 45 Oriental Institute (abbr.)
- 46 Atoll (2 wds.)
- 47 Darwin's laboratory
- 48 Golf accessory
- 52 \_\_\_ Perce Indians
- 54 Whales
- 56 Gone forever
- 57 Pale
- 60 Eggs
- 61 Fertile delta
- 66 Eu\_\_\_ote or pro\_\_\_ote
- 69 Unwell
- 70 Possess
- 71 Greek "M"
- 74 \_\_\_ lib

Solution on page 31.

Review by  
Lesley Mackay & Charles Beckman

**Lesley:** Novels are often praised for their realism. If a novel's fictional characters resemble people that we know, if we judge its plot to be true-to-life, and if we share its perspective, we are likely to enjoy it. For example, I love George Eliot's *Middlemarch* in part because I see myself and my friends in Eliot's protagonist Dorothea, because I recognize the ups and downs experienced by her young characters, and also because I relate to the novel's principal theme—the dangers and the value of idealism.

It can be wonderful to pick up a book and find your own experiences and thoughts—your own world—imprinted on its pages. However, unrealistic novels can also be full of human truths. J.R.R. Tolkien's *The Hobbit*, a classic fantasy and prelude to the *Lord of the Rings* trilogy, invites us into a landscape populated with dwarves, goblins, dragons, slimy, riddle-making creatures, wizards, and, of course, a sweet, home-loving hero, Bilbo Baggins. In *The Hobbit*, humans, or Big People, have only a peripheral, fleeting presence. Yet Tolkien invites us to find our own humanity in his strange, thrilling adventure story.

**Charles:** Reading this novel, I didn't travel as far as Bilbo, who is persuaded by Gandalf, the wizard, to accompany a band of dwarves on an epic quest to a faraway mountain where a dragon jealously guards the dwarves' ancestral riches; but I did travel quite a distance. I began the book shaking my head, wondering how I was going to get through 300 pages about "a very well-to-do-hobbit." (By the way, Tolkien informs us that this species is "half our height" and likely "to be fat in the stomach," "dress in bright colours," "wear no shoes," and "have long clever brown fingers, good-natured faces, and laugh deep fruity laughs.") But by the time Bilbo and the dwarves arrived at their destination and Bilbo bravely faced the dragon, Smaug, I was hooked.

I found the novel to be a hugely enjoyable tale of quest, conflict, disaster, and success. The book is unabashedly violent, with Bilbo and the dwarves pitted against fierce goblins and malicious animals in scenes of mayhem, imprisonment, torture, and killing. The novel's confrontations are catastrophic, and, at times, I found its violence disturbing. But ultimately I came to view the violence as a necessary, nightmarish aspect of Tolkien's fabulous dream. Amidst blood and

## FASCINATING CLASSICS

### *The Hobbit*

by J.R.R. Tolkien

guts, Bilbo discovers his own resourcefulness, strength, courage, and commitment to his companions.

**Lesley:** I agree, Chuck, that the novel requires us to go to extremes in following Bilbo's battle for survival and, along the way, his heroic transformation. This intensity is one of the book's many surprises. Tolkien begins on a modest, whimsical note, introducing us to the home-loving Bilbo in his comfortable hole with its well-stocked pantry in a hobbit village, unaware that he is about to embark on the journey of a lifetime. When the wizard Gandalf stops by, interrupting Bilbo's pipe-smoking and mentioning that he is seeking someone to undertake a great adventure, Bilbo practically sends him packing:

*"We are plain quiet folk and have no use for adventures. Nasty disturbing uncomfortable things! Make you late for dinner! I can't think what anybody sees in them," said our Mr. Baggins, and stuck one thumb behind his braces, and blew out another even bigger smoke-ring. Then he took out his morning letters, and began to read, pretending to take no more notice of the old man. He had decided that he was not quite his sort, and wanted him to go away."*

As a member of the hobbit community, Bilbo is comfort-loving, conventional, and skeptical of outsiders. By the end of the book, he has shared great adventures with a band of dwarves and established a powerful bond with an elfin tribe. He feels connected to whole kingdoms of beings who once appeared unlikable and sinister.

**Charles:** Here's another surprise: Bilbo wins his new friends and allies in a seemingly unlikely way—by enduring great solitude. Gandalf and the dwarves pressure Bilbo to join their treasure hunt because, they explain, a sign invisible to Bilbo hangs on Bilbo's door attesting that he is an excellent burglar. And, of course, they need a good burglar in order to remove mounds of treasure from a vicious dragon's lair. But although they recruited him, the dwarves aren't crazy about Bilbo, who, for much of the novel, gives the appearance of being clueless, and they often leave him out.

As it turns out, in moments of peril, such as in his long encounter with the slimy, reptilian water creature, Gollum, or, later, in his war against the spiders, Bilbo finds himself alone. By the time he arrives at the group's destination—significantly known as Lonely Mountain—

#### J.R.R. TOLKIEN: A LIFETIME OF FANTASY

by Michael Henry

Peers of J.R.R. Tolkien questioned why a noted philologist and Oxford professor would devote himself to creating a world of fantasy, Middle-earth. Tolkien offered, "I do not remember a time when I was not building it.... I have been at it since I could write."

Born in South Africa in 1892, Tolkien immigrated to England and lost his parents as a child. Taken in by a priest, he learned to escape into fairy tale and myth, developing a literary passion that also fueled his studies. As a young man, he

was awarded a First Class Honours degree in English Language and Literature from Oxford. Returning shell-shocked from World War I, he re-entered academia, eventually winning an Oxford professorship he would hold for 24 years.

In 1926 Tolkien began a lifelong friendship with a colleague, C.S. Lewis, who shared his obsession with Northern, or Old Norse, language and mythology. Tolkien read his stories of Middle-earth to Lewis's delighted literary group, the Inklings. He then read the group *The Hobbit*, which he had conceived



he accepts his essential solitude. He goes by himself into the secret insides of the mountain and, with subtle verbal attacks, he questions and provokes the evil worm, Smaug.

**Lesley:** Bilbo's bravery at the climax of the novel is inspiring. And the earlier scenes you mention, Chuck, are crucial to the novel's, and Bilbo's, development. In the first, the hobbit, lost and wounded in a goblin tunnel, uses his wits and emerging physical courage to escape Gollum, a hideous, deadly being who baits him with riddles as he attempts to paralyze him. By the way, "Gollum" is the noise that Gollum makes when he swallows his living prey. Here's one of Gollum's riddles:

*Alive without breath,  
As cold as death;  
Never thirsty, ever drinking,  
All in mail never clinking.*

The answer, Bilbo realizes, is a fish. Bilbo manages to toss off some riddles of his own and to escape Gollum with the help of a magic ring he has found in the dank, stony darkness, which renders him invisible. This ring comes in handy again after Bilbo makes it back onto land and finds his companions wrapped in spider skeins and strung up in webs. For the first time, Bilbo acts with valiant self-sacrifice, instigating a terrible battle in order to save his companions. With amazing powers of invention, Tolkien makes an implausible conflict between "little people" and spiders come fully alive.

**Charles:** It is impressive, Lesley, to pick up a book written in 1937, before the era of dazzling Hollywood productions, before sophisticated science fiction, and to become immersed in epic, fantastic adventure. High-tech media like today's movies or even yesterday's radio broadcasts can cast a powerful spell, but Tolkien brings me back to the power of the written word.

By the way, it's interesting to consider what motivates Bilbo as he moves deeper and deeper into the heart of adventure. In the beginning, he accepts the dwarves' urging that he join them out of pride and regard for his own brave ancestors. Later he is motivated to continue by hunger, discomfort, and even desperation. But at many points during the journey Bilbo seems to reach higher levels of commitment by himself, acting with new initiative or boldness or generosity. When he meets up with Smaug, Bilbo recklessly announces who he is, and it is someone entirely new:

*I come from under the hill, and under the hills and over the hills  
my paths led. And through the air, I am he that walks unseen ... I am  
the clue-finder, the web-cutter, the stinging fly. I was chosen for the  
lucky number ... I am he that buries his friends alive and drowns them  
and draws them alive again from the water ... I am the friend of bears  
and the guest of eagles. I am Ringwinner and Luckweaver; I am  
Barrel-rider.*



With almost comical enthusiasm, Bilbo proclaims an identity that comes directly from his recent experiences—because of his adventures, he is a new hobbit. In his increasingly rich and humane portrait of Bilbo, Tolkien suggests that life is a road trip, and that we have a tremendous capacity to reconstitute ourselves through adventures along the way. I think that Tolkien's vision is a very positive one.

**Lesley:** I agree, Chuck. This novel entices us all to imagine how great we could be if we put our fears aside, as Bilbo does. Perhaps, like him, we should all go on a long journey in the wild. After all, it's Bilbo's unfamiliar surroundings, in their strangeness and their beauty, that inspire his transformation.

*The Hobbit* is a highly aesthetic novel, not only in its celebration of the natural world, but also in its joyous look at what thinking, feeling beings can create: kingdoms, treasures, even poetry. As evidence, Tolkien weaves the natural world and the sensibility of his little people together in beautiful poems throughout his book. Here's a smattering of the song that the elves sing to Bilbo at the novel's end:

*Sing we now softly, and dreams let us weave him!  
Wind him in slumber and there let us leave him!  
The wanderer sleepeth. Now soft be his pillow!  
Lullaby! Lullaby! Alder and Willow!  
Sigh no more Pine, till the wind of the morn!  
Fall Moon! Dark be the land!  
Hush! Hush! Oak, Ash, and Thorn!  
Hushed be all water, till dawn is at hand! ■*

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as a children's book.

Like many later readers, the Inklings recognized *The Hobbit's* maturity and strength, derived from the tragic/heroic mythology of its Middle-earth landscape. Tolkien commented, "The presence of the terrible is, I believe, what gives this world its verisimilitude." This realism in turn made Tolkien's fantasy profoundly appealing, and *The Hobbit* was soon generating popular interest and acclaim. As C.S. Lewis asserted, Tolkien had sent a powerful message that "the real life of

men" is of a "mythical and heroic quality."

In 1954 and 1955, Tolkien published the sequel to *The Hobbit*, the *Lord of the Rings* trilogy. In 1977, three years after his death, the collected stories and myths he had worked on all his life were published as *The Silmarillion*. ■

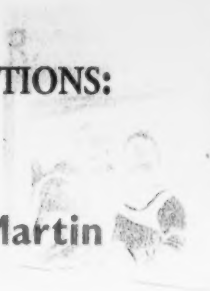
Upcoming Fascinating Classic:

Henry David Thoreau, *Walden*

# EXPLORING CAREER OPTIONS: PHOTOGRAPHY

## Interview with Cade Martin

by Ted Winstead



*Washington, D.C.-based photographer Cade Martin, 30, is equal parts artist and entrepreneur. In business for himself since 1992, the award-winning photographer brings the same artistic vision to the people and places he visits abroad as to the American politicians, celebrities, and CEOs who sit for his portraits. Here's the story behind the pictures.*

*What's the best thing about being a professional photographer?*

The fact that I take photographs for a living! It hardly seems like work—I feel like I'm paid to play.

Also, the camera has been my passport. It has given me access to places that I would never have seen otherwise.

*At 24, you were one of the youngest photographers to work for National Geographic. What was your assignment, and how did you prepare for it?*

The project was on the Indian Railway system. I chased and lived on trains for six

months—diesel trains, electric trains, and steam trains. I covered the country twice by rail. The railway system is the life-line of India, and I used that as a way to show the country.

I prepared for the shoot by talking to people who had been there, reading everything I could, and watching all the great movies about India. But, as I found out, no matter how much you prepare, most of it goes out the window once you arrive. You end up responding instinctively to what you're seeing: taking pictures from the hip, shooting from the gut. And you're hoping along

the way that the magic is going to happen.

*What were some of the challenges you faced working in India for half a year?*

India is a tough place! You have to just go in and start. It takes its toll physically, emotionally, and psychologically. Everyone and everything shares the road—cows, carts, cars, bicycles, camels, you name it. Getting around seems impossible—you are constantly being jostled about. It is sensory overload—every two steps you are bombarded with sights, sounds, and smells

that you have never come across. And emotionally it can be overwhelming.

Between the country and the pace of work, I lost more than 20 pounds while I was there.

*How did India affect you personally?*

The work experience was great, but the life experience was absolutely incredible. I wouldn't trade it for anything. I was fortunate to be on a *Geographic* assignment—"National Geographic" really is the magic buzzword around the world. I was given access to places that I would never see if I went as a tourist. In Calcutta we got to meet Mother Teresa, and she took us to one of the leper colonies, which was on land that the Indian railway had donated.





India is a magical place. It is inexplicable unless you have been there. You will never look at anything quite the same. I also met my wife—like me, a resident of Washington, D.C.—in India on a steam train.

*As an American photographer working overseas, what was your approach to photographing people?*

You want to be respectful of the culture and environment, but I don't think I work any differently abroad than I do in the States. You have to be aggressive, but passive at the same time. I like the fly-on-the-wall approach. Blend in. Don't do anything at first—just sit back, wait, and watch. Allow people to get comfortable with the stranger with the camera. I find people are much more natural and relaxed with that approach than if you barge in kamikaze style and just start taking pictures.

*Is there a down side to travel assignments?*

The most difficult part is actually preparing for departure. The idea of everything you have to do before leaving, and also of finally getting through customs with cameras and film is kind of overwhelming. Once there, you are immersed in your work, and that part is great.

Also difficult is the fact that you can't drive back across town to reshoot if something goes wrong. When traveling overseas or in the States, I always wait until I get back before I process my film. So I have this case of exposed film, and always in the back of my mind, I'm thinking, "Sure hope my cameras are working."

*Have you been taking pictures all your life?*

No. I didn't pick up a camera until I was 20 years old, when I took a basic photography course in college. When I went to school, I had no clue what I wanted to do. I took a hodgepodge of classes and wound up getting a liberal arts degree. I did consider going into computer programming, which I liked, but it dawned on me that in that field





I would have to sit in front of a terminal for the rest of my life.

I liked the photography class enough to take others, but I never dreamed I would pursue it as a career.

*Have you always had a keen visual sense?*

My father taught in the Painting & Printmaking department at Virginia Commonwealth University for 32 years. I grew up surrounded by painters, sculptors, and printmakers. I guess, without realizing it, I received a visual education growing up.

I have learned a great deal from my parents, but growing up, the last thing I wanted to do was something creative. It's a little ironic that I decided to become a photographer.

*How did you turn an interest into a career?*

I went to work for a small newspaper-magazine after college. It folded six months later, and I began to realize how little I knew about making a living in photography.

Courses in school seem to be more about taking "cool" pictures—not much focus on the business end.

I went to work for a photographer and was his full-time assistant for almost two years. This was my education. Once I left, I worked for myself as a freelance assistant, which was great. You get to work with different photographers and see different approaches, styles, and solutions to similar problems. Once you strike out on your own, you can incorporate these experiences into your own vision.

*Would you recommend assisting to a young photographer interested in the field?*

It worked for me. Assisting is a great way to learn about the day-in, day-out realities of the business. You also find out what type of work is out there and what the market is like.

If you want to assist, do your homework. Find out who is doing the type of work that you would like to do and go after them.

*Does the assistant have a chance to take photos?*

No, and that is the hardest thing about assisting. There are a lot of long hours and hard work, but at the end of the day you don't have anything tangible that you created in front of you. You carry equipment and set up lights, but you also get to see how people run their businesses and relate to clients. It's frustrating at times, but you have to look at it as part of your education.

*What kinds of photography are you doing now?*

I try to work on as many different projects as possible. I love doing the commercial work, the magazine work, the annual reports—I really like the variety of my assignments.

I worked on a view book to mark the fiftieth anniversary of the overseas programs of the University of Maryland's University College. I traveled to England, Germany, Korea, and Japan. I followed an alpine rescue team in the Italian Alps by dogsled and helicopter for a Discovery Channel project. In the past few weeks, I have worked on a Georgetown University brochure, Marriot's annual report, and a brochure for Mobil Oil.

I also do a lot of portraiture. I've photographed President Clinton a few times. Most recently, this past Martin Luther King Day, I had complete access to him and was able to follow him around for several hours. A year or so ago, I photographed Clinton on a Wednesday, and the following day I got to do a portrait of Johnny Cash. I was telling someone over the weekend, and D.C. being D.C., he said, "Wow! Clinton!" I said, "Wait, you don't understand—Johnny Cash, the original man in black!" More recently, I photographed Bob Dole one day and Mohammed Ali a day or so later.

*What do you love most about photography?*

I'm passionate about the act—the process of taking pictures. I love the challenge of crawling around looking for an interesting shot and capturing a moment, an emotion, on film. ■



# PLANNING AHEAD FOR COLLEGE

## Developing Social Skills

by Linda E. Brody, Ed.D.

Do you feel socially isolated? Is it hard for you to talk to other students? Many adolescents feel this way, especially those whose interests and/or abilities differ from those of many of their agemates. To get the most out of college, it's important to be able to build relationships with other students, to get along with roommates, to approach professors with confidence. As you prepare academically for college, consider whether you also need to develop and strengthen your social skills before you go.

Just as mathematical and musical talents vary among individuals, so do social abilities. Some people seem to know what to do in a social situation, while others improve with practice over time. The problem is that, unlike math, social skills aren't taught in school. And students who are uncomfortable interacting with others often avoid situations in which they can practice being more comfortable.

Here are some suggestions for improving the ways you interact with people.

### *Assess yourself*

Determine whether you are naturally introverted or shy or timid in social situations, or whether you just don't know what to do because you haven't developed social skills.

Introverted people are drawn to the inner world of ideas, while extroverts prefer to focus on the outer world of people and things. Neither disposition is better, but extroverts tend to be more at ease socially because they are genuinely interested in people. Introverts can develop excellent social skills, but they may find that they continue to prefer activities that involve fewer people. An assessment such as the Myers-Briggs Type Indicator can give you insight into this and other aspects of your personality.

Shyness or timidity can be an inborn trait or can result from low self-esteem or an unpleasant social experience. Shy people often fear rejection by others. Try to identify the source of your shyness and work on overcoming it.

People who are introverted or shy often avoid practicing their social skills. If this sounds like you, remember that many outgoing people also find themselves, at times, at a loss for words or behaving inappropriately with strangers. It's important to recognize that for most individuals, social skills are learned just as mathematical axioms and vocabulary are learned.

### *Seek Support from Intellectual Peers*

You may want to begin by seeking out students whose interests and abilities are similar to your own. Academically talented students may be more comfortable socially with other students who are passionate about learning and are high academic achievers. You may find

more students like yourself by attending a magnet school, enrolling in honors or AP courses, or attending an academic summer program. We often hear from IAAY residential summer program participants that they "found friends like themselves for the first time" there.

You can also find students who share your interests and abilities through activities. For example, depending on your area of interest and expertise, the math team or literary magazine might be a good place to meet people.

### *Expand your interests and your circle of friends*

While it may be easier initially to develop relationships with students who share your primary interests, it's also important to be able to interact with people who represent a broader spectrum of society. You will have more in common with others if you develop skills and interests in a variety of areas. For example, you may love physics and most enjoy being with students who also love physics. But if you learn to play a musical instrument or golf or tennis, or become involved in community service, you will improve your social skills and be enriched by a more varied group of people.

### *Practice talking to strangers*

Walking into a room full of strangers—whether at a party or in a lecture hall—can be intimidating for many people. What do you say to start a conversation? Should you pay a compliment or comment on the weather? Or is something more substantial required? The response depends on the situation, but practice helps. Decide to go up to people you don't know well and start talking. Over time, you will learn what works.

### *Practice building relationships*

Going from initiating "small talk" to building a relationship with another person requires a certain amount of risk-taking. Suggest a follow-up meeting so you can spend more time together and continue your discussion. Or you might suggest a movie or other activity that will not require you to talk as much. Whether or not a relationship continues between you and this individual, you will learn to take more initiative in social situations and gain skills in connecting with people.

### *Seek professional help*

If your discomfort stems from low self-esteem, you may benefit from counseling to help you identify the source of your critical feelings about yourself. Some counselors can also help you develop social skills through role-playing exercises.

### *Conclusion*

You may always be more comfortable tinkering in a science lab, programming a computer, or writing poetry alone in your room than going to a party, and you shouldn't try to change that. It's important to accept your basic social self.

But everyone needs friends and colleagues, everyone needs to be able to interact with the people they go to class with and work with, everyone needs to be able to build relationships with new people they meet. So before you go to college and encounter the world of new people and experiences and opportunities waiting for you, practice your social skills so that you will blossom when you get there. ■

*The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.*

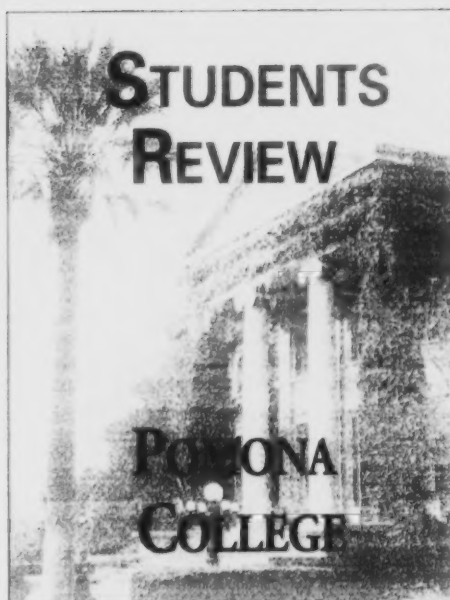
Our reviewers include fifteen students, who major(ed) in art history (1), biology (1), chemistry (1), economics (1), English (3), French (1), math (3), neuroscience (2), physics (1), politics (1), psychology (2), public policy analysis (1), and U.S. history (1). (The number of majors exceeds fifteen because several students have double majors.) Students' comments appear within quotation marks.

### Quality of Academic Instruction for Undergraduates

Pomona is the oldest and largest of the Claremont Colleges, a unique consortium of five autonomous undergraduate institutions on adjacent campuses. Each college opens its doors to students at the other schools; in addition, the colleges jointly sponsor a variety of academic and extracurricular programs, creating opportunities usually found only at large universities. Pomona also sponsors an extensive Study Abroad program.

"I found the quality of education to be excellent and the motivation of the other students to be a constant inspiration. Out of the 30 or so classes I took at Pomona, only one was unsatisfactory. As for the rest, at the risk of sounding hyperbolic, I found the professors to be uniformly excellent—informed and passionate about the subject matter, and concerned that their students get everything they can out of a course. Pomona's a small college. My classes averaged about 15 students, and I really got to know my professors. When it came time to ask for recommendations, many of them knew me and my work."

"Pomona prides itself on being a user-friendly institution. The administration places a strong emphasis on professorial accessibility, curricular flexibility, high-quality resources, and a low student-to-faculty ratio. Our relatively small student body facilitates individual



instruction, while our place as one of the Claremont Colleges ensures that we have numerous resources available to us."

"Instead of having traditional distribution requirements, Pomona requires students to take one course in each of ten categories, including 'Use and Analyze Data,' 'Explore and Understand Another Culture,' and 'Produce or Perform Creative Art.' Called PACs (for Perception, Analysis, and Communication), these requirements reflect Pomona's commitment to provide a true liberal arts education and encourage students to dabble in a broad range of subjects. For the most part, PACs are easy to fulfill, even if you are not good in a subject area, you can find a manageable course. Cross-registration at the other four Claremont Colleges is very easy, and Pomona departments work closely with those at the other schools to ensure that students receive either major or PAC credit for classes taken elsewhere."

"Many college consortia include campuses that are as much as 45 minutes apart by car. In contrast, the Claremont campuses are small and contiguous; you can walk from the farthest corner of Pomona to any other college building in less than 15 minutes. As a result, many Pomona students take courses at the other colleges, and almost everyone encounters students from the other colleges in their Pomona classes. Cross-registration and the small class size help build a real sense of community."

"Pomona offers a wide variety of Study Abroad programs and options, and over half the students here study abroad for at least one

semester. The college has programs all over the world—Nanjing, Oxford, Cambridge, Israel, South America, Africa, and Australia. Oxford and Edinburgh are probably the most competitive programs, but many students opt for more unusual programs in places like Prague, Nepal, or Zimbabwe. Some of the programs are specialized; the Australia and South America programs, for example, are geared to students interested in the sciences, especially ecology and rain forest preservation. There's even a science program at Biosphere. All Study Abroad fees are covered by Pomona's regular tuition."

"The faculty and Study Abroad staff make it easy to take advantage of this wonderful program no matter what your major. Being a premed would have made Study Abroad difficult at most schools, but here it was easy to fit my abroad experience into my academic schedule. I even had space left over to take courses outside of my major."

### Social Life

Reviewers enjoy Pomona's quiet, campus-based social life, five-college extracurriculars, and the many nearby off-campus opportunities.

"The campus is lush and beautiful, filled with plants I had never seen before coming to California: bird-of-paradise, bougainvillea, palms. Many of the buildings are Spanish-mission style, and art is everywhere on the campus: fountains, sculptures, even a mural by Mexican artist Jose Clemente Orozco. For those who long for an un-Californian vista, Marston Quad features a Shakespeare garden, which includes every flower mentioned in any of his plays."

"Virtually all students are required to live on campus, fostering a campus-based social scene. First-year students live in 'sponsor groups' with 12–20 other freshman and two sophomore sponsors, and most upperclassmen live in doubles. I enjoyed living in the dorms and eating in the dining halls for four years, but not everyone wants such a structured social life."

"The Claremont Colleges offer many cultural, musical, theatrical, cinematic, social, and alcoholic ways to pass your time, and you can choose whatever you want—there's no prevailing attitude of right or wrong. Pomona does have a few frats (two of them co-ed), but they have very little effect on campus social

life. With five colleges, there's always something going on. And if you can't find an organization or activity to suit your interests at one of the colleges, you can always receive support to start a new one."

"Claremont the town is by no means a college town; it's a small, quiet burb that now doubles as an upper-crust retirement community. Most shops are boutique-y and over-priced, and there's nothing faintly resembling an off-campus student 'hang-out' within 20 minutes of the campus. Thus, the raves, dances, and concerts we attend are on campus, at any one of the colleges."

"We're right at the foot of the San Gabriel Mountains and an hour from Joshua Tree National Monument, which means that there are quite a few nature-oriented activities to be found: hiking, biking, camping. Beaches are 45 minutes away, and skiing is an hour away. In fact, Pomona has an annual ski-and-beach day, where you go skiing during the day, then hit the beach for dinner and a bonfire. Where else but Southern California can you do both in a single day?"

"A car is useful. On a good day, it takes 30 minutes to get into Hollywood, with its many shops, clubs, galleries, museums, theaters, and Griffith Observatory. Hollywood is very, very cool. I wouldn't, however, want to be closer than we are now. I really feel that Claremont offers a great balance between suburban peace and urban riot. It's nice to riot, but I like to be able to retreat."

### What Do You Like Best about Pomona?

"I like the sense of community and personal attention. Sponsor groups foster that intimacy from the get-go; you have the sense that you *matter* and that people are concerned about and supportive of you. I like that all the students are so close, both physically and socially. I like that the faculty can get to know you so easily. I like that the administration involves us in the running of the college: students attend all faculty meetings and participate in every faculty and administrative search."

"The classes—we have a really amazing number of offerings for such a small school. The rewarding yet low-key extracurriculars. The Career Development Office, which can find you an internship anywhere. The Study Abroad programs."

"The atmosphere here is really relaxed. It helps that even in December, it's sunny and

75° outside, but almost everyone here is happy with the school. The classes are small and good, and you really get to know people both in and out of class."

"I wasn't sure I wanted to attend a school so far from home, but the change has been wonderful. The students here are much more relaxed than at the northeastern colleges I've visited, and the opportunities in the surrounding area much more varied—not only the kaleidoscopic resources of LA, but also the beaches, lakes, mountains, and desert."

---

## POMONA COLLEGE

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---

- 4-year private coed college.
  - Suburban campus 30 miles east of Los Angeles.
  - Full-time undergraduate enrollment 1997-98: 727 men; 658 women.
  - Special features: Member of a five-college consortium, the Claremont Colleges. The other colleges are Claremont McKenna, Harvey Mudd, Pitzer, and Scripps.
- 

### What Do You Like Least about Pomona?

"Even though I'm from LA and so am used to smog, I've found Claremont's air quality to be particularly nasty. Living at the foot of the San Gabriel mountains is great—when you can see them!"

"School spirit isn't what it could be. Many people are laid back about everything but work. Too many take their opportunities for granted and don't make the most of their time here."

### Who Would Be Most Compatible with the Academic and Social Atmosphere at Pomona?

"I grew up on the East Coast. When it came time to choose a college, I wanted a premier liberal arts education, but I also wanted to avoid what I saw as the privileged, old-boy network of the Ivy League schools. Pomona offers the best of both worlds: a great education without the bonds of tradition. For me, California has lived up to its 'follow your

bliss' mystique. No one tries to mold you into their idea of success. I see individuality and open-mindedness as the two most important characteristics of a Pomona student, without them you won't be very happy here."

"Students who don't need a pressure-cooker environment in order to succeed. The people here are not just bookworms; they know how to enjoy life. The atmosphere is laid back, but we study hard as well. Over 40% of Pomona graduates end up going to law school or medical school."

"Someone who takes responsibility for their life. The school and the area have an enormous amount to offer. Those willing to exert themselves will be well rewarded."

### If You Had It to Do Over Again, Would You Go to Pomona?

All reviewers enthusiastically said yes.

"Definitely. The students are highly motivated, but the atmosphere never feels cutthroat. That may, in part, be attributable to the climate. The weather, save for the smog, is beautiful. I remember returning from winter break one January, going from 30° to 85°, dropping my bags off in my room, putting on my bathing suit, and diving into the pool. Not only would I choose Pomona again, I cannot imagine being happier anywhere else."

"Yes. The education is superb, the location desirable, the opportunities (pre- and post-graduation) numerous. I was able to get away from the East without sacrificing academic excellence or name recognition. I'm confident that my degree will be a passport to any career path I choose."

"In a heartbeat. In fact, I'm now getting my Ph.D. with the hope that I will someday be able to return to Pomona to teach." ■

*As you try to find the school best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.*

*Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or IAA.*

# ImaGiNe...

## Morning Song

—to Michelle

On that fog-tinged morning  
we stood beside a somber stream,  
train-track dust beneath our feet.  
I read the cries spray-painted on the bridge—  
some once-bright, defying  
the dingy and dark with vivid longing  
for one kiss more—that would surely give the meaning—  
but most merely slinking black scrawls  
voicing the same grim messages the train spoke  
as it growled by, relentless.  
I dared not look down at the shattered glass of dreams.

But it was you  
who saw the honeysuckle,  
and we picked a sprig and shared it,  
voices raised in morning-song.

We plucked the green bud-ends  
from each blossom, pulling gently  
on the slender filament until  
the flower freely gave its only gift,  
its one stroke of gathered light.

Your voice gilded the fine gold  
of sun and dew and stream  
and faint honeysuckle scent.  
I joined in, a third below.  
The railway ceased its groaning  
and the stream was shining, hopeful.

Each drop of wild nectar  
was sweet, surpassing sweet,  
beyond description. And each caught  
the aura of song, sun, stream,  
together blurring, drenching, melting  
into one golden scent  
that held it all, diffused.  
And so it is with single moments, sister,  
of all the times your voice and mine  
have pressed on into the skies,  
harmony distilled to one sweet song. ■



## reflection

she stands opposed to herself  
eyes full of questions  
searching the eyes of a near stranger

reaching toward the contours of a face  
each move countered  
by the cold of her own hands

beyond what is real  
perhaps there plays a different music  
a bright impossible world around the corner

but there is no crossing over  
so walking a wary parallel  
her mirrored selves part ways

still haunted by the hoped for  
peripheral shadows of what might be  
inside her lies a truth she cannot touch. ■



*Caro-Beth Lillback is a senior at Delaware County Christian School in Newtown Square, Pennsylvania. You can email her at [caro@earthling.net](mailto:caro@earthling.net)*

## YOUR WRITING COULD BE ON THIS PAGE!

We welcome submissions of poetry, short stories, essays, book reviews, and puzzles. Please write to *Imagine* ■ SET at IAAY ■ The Johns Hopkins University ■ Baltimore, MD 21218



# THE COACH'S CORNER

*This Coach's Corner spotlights MATHCOUNTS, a national coaching and competition program for seventh and eighth grade students. MATHCOUNTS fosters advanced mathematical problem-solving, recognizes high achievement in mathematics, and opens doors to new friendships and fun. Schools throughout the country participate in year-round practice sessions and local and regional competitions. MATHCOUNTS culminates each May in a national competition held in Washington, D.C.*



Photo by Art Stein

In the 1998 MATHCOUNTS National Competition, held on May 15, students competed, as always, both as individuals and on teams. Ricky Liu of Newton, Massachusetts, defeated 227 competitors to win first-place; he was awarded a gold medal, an \$8,000 scholarship, and a week at the U.S. Space Camp in Huntsville, Alabama. Po-Ru Loh of Madison, Wisconsin, and Zhihao Liu of Shorewood, Wisconsin, took second and third place, respectively. The top-scoring female was Sarah Gilberg of Washington, D.C. Wisconsin captured the first-place team award.

If you are a middle-school student with a passion for numbers, MATHCOUNTS can take you beyond the classroom into a fast-paced learning adventure. Check the contact information we provide on page 31. But first, sample these problems from the 1998 MATHCOUNTS National Competition.



Photo by Art Stein

Mathematics has been defined as sustained intellectual honesty. That's the basis for a successful math team. During teamwork, we learn quickly to say not what is expected, or popular, but what is worthwhile and valuable. We learn to evaluate a person's ideas apart from our perception of that person. We learn to distill everyone's ideas into a solution because dismissing another's thoughts may mean a solution will elude us.

—Kathy Miles,  
MATHCOUNTS coach,  
chair of the MATHCOUNTS  
Coaches' Advisory Council

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## Questions from the 1998 National MATHCOUNTS

- How many positive integers exactly divide 225,225?
- Clock A loses 30 seconds a day, and clock B gains 45 seconds a day. If clock A is 10 minutes ahead of clock B, how many days will it take clock B to be five minutes ahead of clock A?

- Fill each box with a different prime number in such a way that no two adjacent boxes hold numbers that differ by 2, and so that the sum of all nine primes is as small as possible. What is the sum of the nine primes?



- The figure below consists of a large circle with successively smaller inscribed equilateral triangles and circles. The area of the smallest circle is  $4\pi$  square meters. How many square meters are in the area of the largest circle? Express your answer in terms of  $\pi$ .
- How many even four-digit numbers greater than 7,000 can be formed using the digits 3, 4, 5, 7, and 9 when no repetition of digits is allowed in a number?
- A bag contains only blue and green marbles. If three green marbles are removed from the bag, the probability of obtaining a blue marble would be  $5/8$ . What was the number of blue marbles in the bag before any changes were made?



1. 72; 2. 12; 3. 100; 4. 64; 5. 12; 6. 18

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### Spring Seminars:

Creative Connections seminars for 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> grades  
Discovery Series for 5<sup>th</sup> and 6<sup>th</sup> grades  
Odyssey Seminars for 7<sup>th</sup> and 8<sup>th</sup> grades  
Career Symposia for 10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> grades

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# MARK YOUR CALENDAR...

*with these September–November registration deadlines  
for selected academic competitions. Inquire about  
competition format, dates, and fees.*

## DEADLINE COMPETITION

- September** **United States Academic Decathlon**—Schools register teams, grades 9–12; state deadlines vary; 10882 Kyle St., Los Alamitos, CA 90720; (562) 626-0092.
- October** **Future Problem Solving Program**—Schools register teams, grades 5–12; ask about state affiliates; 2500 Packard St., Ste. 110, Ann Arbor, MI 48104-6827; (313) 973-8781; (800) 256-1499; [www.fpsp.org/](http://www.fpsp.org/)
- October 9** **Mandelbrot Competition**—Schools register, grades 9–12; request invitation letter by Sept. 15; Sandor Lehoczky, Greater Testing Concepts, P.O. Box 380789, Cambridge, MA 02239-0789; [www.mandelbrot.org](http://www.mandelbrot.org)
- October 15** **National Geography Bee**—Principals register schools, grades 4–8; National Geographic Society, 1145 17th St., NW, Washington, DC 20036-4688; (202) 828-6659; [www.nationalgeographic.com/society/ngo/geobee/](http://www.nationalgeographic.com/society/ngo/geobee/)
- October 15 or November 1** **American Junior High School Mathematics Exam (AJHSME)**—Schools register, up to grade 8; lower fee for earlier date: Dr. Walter E. Mientka, American Mathematics Competitions, Department of Mathematics and Statistics, University of Nebraska, P.O. Box 81606, Lincoln, NE 68501-1606; (402) 472-2257; (800) 527-3690; fax (402) 472-6087; [www.unl.edu/amc](http://www.unl.edu/amc)
- November** **MATHCOUNTS**—Schools register teams, grades 7–8; MATHCOUNTS Registration: MATHCOUNTS Foundation, National Society of Professional Engineers, 1420 King Street, Alexandria, VA 22314-2794; (703) 684-2828; [mathcounts.org](http://mathcounts.org)
- November 15** **U.S. Senate Youth Program**—Each state nominates two delegates and alternates in grades 11–12 who are elected student leaders; ask your high school principal, chief state school officer, or office of DoD Dependents Schools.

## DEADLINE COMPETITION

- mid-November** **National German Test**—German teachers register, German II–IV: American Association of Teachers of German, 112 Haddontowne Ct. #104, Cherry Hill, NJ 08034; (609) 795-5553, fax (609) 795-9398.
- November 18** **Knowledge Master Open**—Schools enter one team per division (middle, junior high, high school); Academic Hallmarks, Box 998, Durango, CO 81302; (800) 321-9218; [greatauk@frontier.net](mailto:greatauk@frontier.net)
- December 2** **Science Talent Search**—Students enter individual original projects, grade 12 only: Science Service, Inc., 1719 N St., NW, Washington, DC 20036; (202) 785-2255; [www.sciserv.org/stshome.htm](http://www.sciserv.org/stshome.htm)
- Other** **National Spelling Bee**—Scripps Howard, Inc.: Students enter only through a sponsoring newspaper; ask your local press if they participate, or find your local sponsor at [www.spellingbee.com/particip.htm](http://www.spellingbee.com/particip.htm)

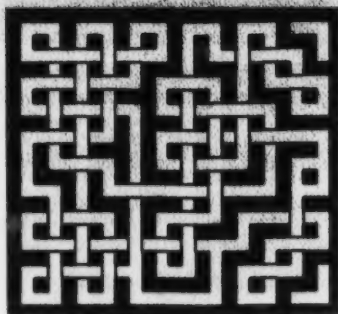
## Solution to Word Wise



More about...*Sargasso*  
1 Down is a word you may know from literature rather than science. The Sargasso Sea is an area of the Atlantic Ocean bounded by the Gulf Stream and Equatorial currents. Ocean and air currents conspire to make the Sargasso Sea a warm, sluggish mass of water rarely refreshed by wind, rain, or storm. In that

calm, islands of seaweed—*sargazo* in Portuguese—float languidly on the water's surface, creating an ocean landmark dreaded by sailors. For ships powered only by wind, the torpid Sargasso Sea was an uncanny expanse whose crossing was always disturbingly slow.

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# Knossos Games

*by Tim Boester*

After teaching at IAAY's Center for Academic Advancement this summer, **Tim Boester** has begun graduate studies in mathematics at the University of Wisconsin.



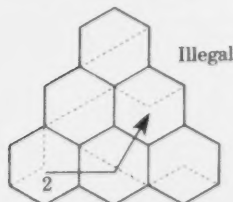
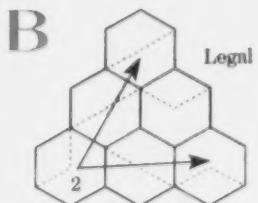
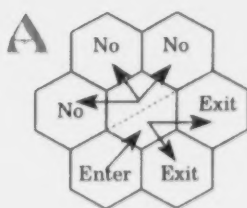
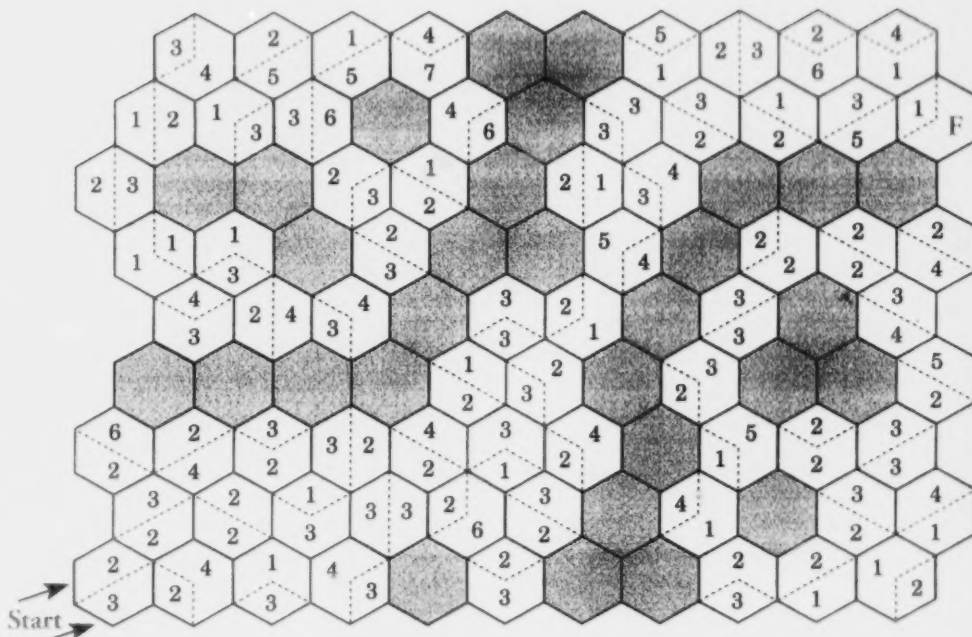
## The Croak

Start at either Start and finish at F.

### The Rules:

These are a bit complicated, so we've included some examples.

- 1) You must exit a hexagon on the same side of the dotted line that you enter (example A).
- 2) The number in the hexagon indicates the number of hexagons you must jump in your next move (example B). Use the number on the same side of the dotted line as your entry point; ignore the number on the opposite side of the dotted line.
- 3) Each move must travel a straight line (example B, Legal *versus* Illegal moves).
- 4) Ignore the dotted lines in the hexagons that you **jump over**—the dotted lines are relevant only in the hexagons you **land on** (example B).
- 5) You may **jump over** but not **land on** the shaded hexagons. All hexagons—including shaded ones—count in computing jumps.



**Solution to Knossos Games**  
in our May/June issue:

The grid shows a 15-puzzle state. The numbers 1-15 are distributed across the grid, with some cells being empty. A thick black path highlights a sequence of moves starting from the initial state (top-left) and ending at the goal state (bottom-right). The path starts at (1,1) and ends at (15,15).



VOLUME 6 • NUMBER 2

Opportunities and Resources for Academically Talented Youth

November/December 1998

## SPOTLIGHT ON THE PERFORMING ARTS

Interview with Edward Norton

Revitalizing Cities

Stranger in a Strange Land

Students Review *The Johns Hopkins University*

*Imagination: a portrait of The Johns Hopkins University*

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## Focus On: The Performing Arts

LIKE MATHEMATICS, THE PERFORMING ARTS APPEAL TO OUR DESIRE FOR LOGIC, order, and balance. If you were to analyze the text of *Oedipus Rex*, the libretto for *The Magic Flute*, or the score for the *Eroica* symphony, you would see that patterns and structure underlie these works of art. But, of course, the artistic arrangement of words and notes is only half of the story.

Perhaps you've had the experience of reading a Shakespearean play for class, then seeing either a live or recorded performance of the play. Suddenly, the text comes to life: the characters become real people with real feelings, and we respond to them with real feelings of our own. The same thing happens when score turns to sound, and sound to dance. We respond not just with our brains, but with our hearts.

In this issue of *Imagine*, we explore the performing arts through the perspectives of young musicians, dancers, and actors. Their experiences in arts schools, summer programs, competitions, and concerts reveal not only their talent, but also their dedication and passion. You'll also hear from an award-winning playwright and a music theorist who describe what it's like to create and study the texts these artists perform.

Whether you seek the spotlight or balcony seats, the performing arts offer ways to balance an appreciation of artistry and a fascination with form. Read on to see how several young artists are achieving this balance through study, practice, and creativity. ★

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### Imagine...

Opportunities and Resources for Academically  
Talented Youth\*

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On the cover: Danayra Johnson, of Detroit, MI,  
performs with the World Youth Symphony  
Orchestra at Interlochen Arts Camp. Photo by  
David Speckman, courtesy of Interlochen Center  
for the Arts.

For more information about Interlochen Arts  
Camp, see page 8.

# I Got Rhythm

Ethan Abraham

*"From the Creator to the artist, direct to the audience, split-second timing. All other music like that."*

—Art Blakey, jazz drummer

IN MY BASEMENT, I AM TRYING, STRUGGLING, for the tenth time to play along with John Coltrane's "Blue Train." Even though I've heard the song a thousand times before, I still can't seem to make my playing sound right. Maybe it's my snare drum. I tighten the head, but something still sounds wrong. Maybe I'm not loose enough—I've had a stressful day at school. I let the tune play a few more times, thinking that I must be missing something. In the end I compromise. So what if I am not the next Philly Joe Jones or Max Roach? I can still have fun playing drums. I can still have fun playing jazz.

When I was younger, my parents and teachers always corrected me for tapping my fork on the table or my pencil on the desk. So when I got to middle school and could choose the instrument I wanted to play, drums were the natural choice. I quickly joined the concert band and within two years progressed to the school jazz band. Two years later I was accepted to the regional jazz band, which gave me the opportunity to play with talented musicians from around North Jersey.

When these bands could no longer satisfy my musical appetite, I knew I needed another creative outlet. Jazz for Teens at the New Jersey Performing Arts Center was exactly what I was looking for. This program required a serious time commitment, running for ten Saturdays from 9 a.m. to 3 p.m., but it was worth it for the chance to play with other teens and to learn from a faculty of professional musicians. These Saturdays began with listening sessions, where each week a different faculty member shared some of the music that inspired him

or her. These sessions followed by jamming sessions where we could play along with the recordings. Although we had no formal lessons, we learned and played many more, just for the chance to play. Everyone there was really talented; many of the other drummers were much better than I, but this only inspired me to go home and practice more. More



than any previous musical experience, this program allowed me to immerse myself in jazz and showed me the level of musicianship I could attain.

After seeing how much I still could learn, I decided to attend the Vermont Jazz Center's Summer Jazz Program. Unlike Jazz for Teens, this program ran for one straight week, which meant that I had no time between sessions to recuperate. And the participants were not only high school students; in fact, I interacted with people who had been playing jazz since long before I was born. At first, I didn't think I would be good enough to play with such experienced musicians. After the first jam session, however, I realized that everyone was there just to have fun, to learn, and most of all, to play. The drum instructor was Bobby Sanabria, a great jazz player and an expert in the Afro-Cuban style, and his master classes opened up a whole other world of music to

me. I really knew what I was playing or what real jazz should sound like until I attended these programs. One of the most exciting things about jazz is that it is almost completely improvised. A typical tune will have a one-minute or so "head" that leads into a jam session where each musician takes an improvised solo, maintaining the chord changes and general feel of the song.

For me, as a drummer, the room for spontaneity is even greater. I usually have a copy of one the horn players' charts, if any music at all. No one tells me when to play or what to play. If I want to transform the feel in the middle of the song from swing to Latin, I can and will do so. I have a responsibility to keep the time rock-solid, but I am also free to embellish however I please, adding another dimension, another texture, to the music.

In order to play any style of music, you must learn the language of that style, and participating in jazz programs helped me to become multilingual. That is why I enjoy playing a wide range of music, from big band at school, to small-group jazz on the weekends, to rock in my basement and at "Battle of the Bands." The most important part of playing any music is making it sound good and giving your audience a good time. There is no better feeling than finishing a great solo, or ending a great tune, and hearing your audience erupt in applause. ★

Ethan Abraham is a junior at the Academy for the Advancement of Science and Technology in Hackensack, N.J. An avid competitor in math contests, he also enjoys doing chemistry research and participating in Model U.N.



# Center Stage with NYCO

by Zachary Wissner-Gross

I HAD EVERY REASON TO BE NERVOUS. It was opening night of *The Turn of the Screw* at Lincoln Center in New York, and I would be playing a starring role. My teacher and many of my relatives would be there. And I heard that critics from all of the major New York publications would be in the audience, evaluating my performance as Miles. I had even been told that the New York City Opera company's new management was counting on me to give a first-rate performance, in this, their first new production.

But I wasn't nervous at all. After weeks of rehearsing and preparing, I was ready. I knew every note, every step, every cue. My grandfather called this calmness "ice in the veins." I called it preparation. In fact, I'm much more anxious on the pitching mound than on stage in front of thousands of people. On the mound, you never know the outcome; but on stage, everything is predictable.

Of course, I did not always know this. When I joined the opera company at age 7, I asked my mother if Carmen always died, or if in some performances she was spared. When my older brother, Alex, played a street urchin in *Carmen*, I used to watch carefully to detect any plot changes. There never were any.

But *Carmen* is what ultimately inspired me to audition for the New York City Opera (NYCO). It wasn't the music, although I loved the music; nor was it the drama. It was the lively atmosphere backstage. In *Carmen*, the children appeared only in Acts 1 and 4. That left two hours' free time during Acts 2 and 3 to hold tournaments in Egyptian war, poker, and Connect Four in a room two soundproof floors below the stage. While sitting in the audience with my parents, watching Act 2 for what seemed like the hundredth time, I



Photo by Craig Rosegg

Zach Wissner-Gross with Laura Flanigan in *The Turn of the Screw*



thought of the children playing backstage. I decided to audition.

The usual audition song is "Happy Birthday," but as a true baseball fan I came prepared to sing "The Star Spangled Banner." To my surprise, I was asked to sing "Pop Goes the Weasel" instead. I was accepted on the spot.

As a member of the chorus, I performed in *La Bohème*, *Carmen*, *The Magic Flute*, *Turandot*, *Mefistofele*, *Tosca*, and *Esther*. I landed my first starring role in the world premiere of Joel Mandelbaum's *The Village*, a beautiful and moving opera based on the true story of a boy who hid from the Nazis during World War II. In the audience on opening night were Stephen Orenstein, the man upon whose life the story was based, and his wife, Susan Fox, who wrote the libretto. I felt



Backstage as Amahl with César Ulloa (King Kaspar) at Avery Fisher Hall, Lincoln Center



Zach, age 9, backstage, playing Connect Four with Melissa Berman, another chorus member in *Carmen*

proud when Mr. Orenstein told me that I reminded him of himself.

Another of my favorite roles was that of Amahl in Gian Carlo Menotti's *Amahl and the Night Visitors*, an annual holiday presentation at Lincoln Center's Avery Fisher Hall. We performed three shows in one day, each to a sold-out 3,000-seat audience. I especially liked the audience interaction. During the opera, I got to give an apple to a child in the front row. At the end of each performance, alone in the spotlight, I waved to the audience. Hundreds of wide-eyed children called back, "Goodbye Amahl!" and "See you next year!" Between shows, I signed autographs. I enjoyed my one-day celebrity, and got to meet—and sing for—Menotti.

Backstage at *Amahl*, Joel Mandelbaum told me that the most coveted role for a boy soprano was that of Miles in Benjamin Britten's *The Turn of the Screw*. When NYCO's new management announced months later that *The Turn of the Screw* would replace another opera on the schedule, I wanted the part badly. I had never seen the opera, so my parents bought the video. Then we got audio tapes, which I played repeatedly

at bedtime to familiarize myself with the music. Next, I worked with my City Opera voice coach, who was also preparing other boys for the audition. When audition day arrived, I knew two arias and felt confident as my voice reverberated up to the top balcony. About a month after the audition, I got the news: I had been selected for the starring role of Miles.

On opening night, the media arrived in full force to see how NYCO's showcase opera under new management would fare. It was a great success! I was also excited to receive rave reviews in *The New York Times*, *The Wall Street Journal*, *New York* magazine, and other publications.

As it turned out, *The Turn of the Screw* marked the end of my four-year opera career. Shortly after my last performance, my voice began to change, and my soprano days were over. But it was a great run, and I learned that when you want something in life, you should practice, work hard, and then go for it. And you just may find yourself on center stage. ★



Zach, age 8, backstage with other chorus members in *Tosca*

In temporary retirement from singing, Zach Wissner-Gross pitches for Great Neck South Middle School's baseball team. He also participates in Junior Matriotes and MATHCOUNTS and is ranked first in Nassau County in both. Next year, he hopes to sing baritone with the Great Neck South Opera Theater, New York State's only public high school opera company.

# INSIDE THE MUSIC: Research and Theory

by Jocelyn Neal

*For five straight hours I have been sitting in the archives wearing headphones, focused on the subtle twangs of guitar chords in the last recordings Jimmie Rodgers made in 1933. At one point in the tune "Somewhere Down Below the Dixon Line," I hear the hint of guitar strings just before the session player suddenly changes his chord; that one stified chord indicates a mighty conflict in the perception of musical form. Jimmie Rodgers, "Father of Country Music," was molding his musical phrases into a new pattern of accents, altering the way that we perceive the passage of time in a song (and catching his guitar player off guard!). I can't telephone Rodgers to discuss his perception of song structure, so all I have to work with are my ears, a pencil, piles of notes, and stacks of borrowed CDs. But I'm convinced that hidden in these recordings is a better understanding of how the human mind processes musical structure. The search for this understanding is the work of music theorists.*

IN SPITE OF A LIFELONG LOVE OF MUSIC, plus piano, violin, and voice lessons from age 3, I never intended to pursue a musical career and focused instead on math and science. When I started college at Rice University in 1989, I planned to study mechanical engineering, taking the requisite courses but filling out my schedule with electives in music. After three years, I realized that although I enjoyed engineering, I had a passion for music. I searched for a way to combine the patterns, symmetries, problem solving, and analytical approaches of engineering with the emotional connection of the performing arts and found the answer in music theory. Nearly ten years later, I find myself finishing a Ph.D. at the Eastman School of Music.

When I began my graduate work, I quickly discovered that musicians need experience in many academic fields. Music is full of literary, philosophical, scientific, and technological references. Truly understanding music requires understanding its cultural context, which is different for nearly every composition. For example, a sensitive interpretation of a late Schubert piece is enriched

by knowledge about nineteenth-century Viennese culture, the tradition of *Lieder*, and Schubert's failing mental health. These factors arguably appear in the music itself, and a mature performer will reveal the layers of embedded emotion and meaning.

Through its emphasis on the context, structure, and meaning of compositions, music theory offers practical skills to performing musicians. But theory begins by attacking the fundamental puzzles of how music actually works. For instance, you have probably hummed the *Jeopardy!* theme, but did you know that the middle of this catchy tune is a musical rubber band pulling you in two directions at once? The

**Truly understanding music requires understanding its cultural context, which is different for nearly every composition.**

key change superimposes a descending whole-tone scale on an ascending modulation, one musical force going up and one going down. No wonder the tune sticks in our heads! Music provides a seemingly endless supply of increasingly complex riddles to solve; music theory offers the tools for analyzing such "sound" effects and explaining them systematically.

The outcome of theoretical research is knowledge about music, but drawn from many academic disciplines and focused on a wide variety of topics. Some theorists study the history of music theory, looking at notation systems, compositional practice, and philosophical perspectives. Others may specialize in a single composer or genre, researching questions such as what makes Haydn different from Mozart. Still others engage in cross-disciplinary research: some team up with psychologists or neurologists to run experiments on how the mind processes musical sounds; some join forces with mathematicians or computer scientists to explore electronic music; others work with philosophers on the logic of the various analytical systems.

My own research focuses on the perception of musical structure and the relation-

ship of text and music, applied to country music. The seeds of my dissertation emerged from a most unlikely occurrence: while teaching a dance class, I explained that the basic pattern of swing dancing occupies six beats, yet the basic chunks of music occupy only four beats. This simple conflict caught my attention as I noticed similar relationships in musical phrases, where time is marked differently in each instrument. When these irregularities began to appear in predictable patterns, a research topic emerged. Because I am tracing metric and rhythmic patterns that have been passed on and developed in an informal tradition, most of my research requires listening to recordings or live performances. Friday nights frequently find me at a local concert or dance hall working on my dissertation! I fill a pocket with note cards and then spend the evening transcribing the patterns that appear in the music and the dancers' steps.

So what does one do with a degree in music theory? I'm the first to admit that there is not much money in this field. Some music scholars write reviews, arts columns, concert programs, or liner notes for recordings; others work in music publishing or as music technology consultants. Most teach at a university. Teaching appeals to me because it offers the opportunity to guide young musicians in their understanding of the art. I was once given sage advice for choosing a career: figure out what you would love to do every day; then figure out how to get paid for it. Although music theory is not so much a "career" as it is a search for knowledge, I get to spend every day studying music, and I consider that a priceless opportunity. ★

Jocelyn Neal is an instructor of music theory at the University of Rochester. Currently a doctoral candidate at the Eastman School of Music, she spends free time

ballroom and swing dancing, working on theater productions, and playing volleyball.

Jocelyn can be contacted at [jneal@theory.esm.rochester.edu](mailto:jneal@theory.esm.rochester.edu)



# The Piano and I

by Tiffany Hsieh

*Imagine performing in front of two hundred people, alone on the stage with spotlights and everyone's expectations fixed on you. When I played at the Irvine Barclay Theatre, all I could think of was how many people were in the audience, how large the piano was, how cold my hands were, and whether I would actually be able to survive the event. Once I started playing, however, all my nervousness disappeared; the music calmed me down—as it always does—and I was completely at ease.*

I HAVE BEEN PLAYING THE PIANO SINCE I was four. My mother, a graduate of Cleveland Institute of Music and an accomplished pianist herself, taught piano. I had always listened to her students play, and when she asked if I wanted her to teach me, I eagerly accepted. She taught me the basics, such as how to read notes and distinguish rhythms, and then I switched to a private teacher.

I was enthusiastic about learning how to play, but like any other small child, I often grew impatient just sitting still. Mastering the piano requires immense discipline and patience, and more than once I whined that I wanted to quit. My mother, who had obviously been through these same frustrations, advised me to stick with it. Even as I grew older, I often found it tedious to work on the fundamentals of technique and theory. But the first time that someone at an audition told me, "I was really moved by how you played that étude," the hours I had spent at the keyboard all seemed worth it. I knew then that I had the power to touch others—a glorious and gratifying feeling.

This feeling cannot compare, however, to the excitement of competition. I entered my first piano competition at the age of seven: the third annual Taiwan Benevolent Association of California (TBAC) Music Competition, held solely for Chinese students. Since I was so young at the time, I

was more excited than nervous. Placing second made me work even harder for the next competition. When I took first place the following year, I had tasted the thrill of winning and wanted more.

I have won many, but not all of the numerous competitions I have entered since then. I enjoy winning, but I always learn something by participating. For example, I have learned that I must never underestimate my competitors. I realized this the third time I entered the TBAC, overconfident and sure that my piece, a flashy technical composition, would make a greater impression on the judges than the slower, more lyrical pieces that some of the entrants



*Tiffany in rehearsal with the Southwestern Youth Music Festival Orchestra*

played. When the judges announced that I had placed third, I was shocked and, ultimately, humbled. I have also learned that a successful performance cannot be compared to acing a test; there is no "correct answer" or "correct interpretation" of a piece. Even if I play well, the judges might disagree with my interpretation of the music. I am trying, therefore, to set my own standards and to be pleased if I achieve my own goals.

More recently, I have tackled a new challenge: playing in ensembles. The best thing about ensemble play is meeting many talented people who love the music as much as I do. I played the Mendelssohn D minor trio with two members of the L.A.

Philharmonic and have also performed with various orchestras, including the Young Musicians' Foundation Debut Orchestra. These experiences have taught me that, in ensemble play, communication between all of the players is vital. If we disagree on tempo and dynamics, or on non-verbal cues for coming in, the piece will quickly degenerate into a discordant chaos.

Many things that I've learned by playing the piano have carried over into other areas of my life as well. When I applied for a volunteer position at UCLA two summers ago, I was apprehensive about the interview. But I was able to restrain my anxiety, all too familiar from piano performance, and got

the job. Because performance has taught me deep concentration, I can more easily focus on schoolwork; and since I have grown accustomed to large audiences, I am more confident when speaking in front of others. Playing the piano is also incredibly soothing. I can understand why many doctors listen to classical music while they operate, and why music is so often used in healing and therapy.

I plan to continue taking lessons when I attend college. I am leaning towards studying medicine and science, so playing the piano will offer a welcome distraction from the facts and statistics. I am also

hoping to master many more pieces in the enormous piano repertoire. Even if I do not strive for a professional career in music, I can say that music has made me a more well-rounded person and has allowed me to grow in innumerable ways. ★

*Tiffany Hsieh, currently a junior at Crossroads School for Arts & Sciences in Los Angeles, also enjoys writing plays and short stories. She spent this summer volunteering in an immunology lab at the UCLA Children's Hospital.*





# FOR THE LOVE OF DANCE

Just as students who love physics or writing might consider attending a magnet school or a summer program, aspiring dancers can choose from many options to develop their talent. Here, two young dancers describe how they've pursued their love of dance in different ways: at a summer dance camp and at a residential arts school.



## Interlochen Arts Camp

by Maggie Bergeron

I'VE ALWAYS BEEN PASSIONATE ABOUT dance—it's how I express myself. So it's probably not surprising that even after two years of serious training at Interlochen Arts Academy during the school year, I returned as a summer intern in the Dance Division. As a ballet instructor and student, I learned how valuable a summer program can be for dancers who want to improve their stamina, technique, and artistry, all while becoming a more well-rounded person.

Interlochen's summer dance program is an intensive eight-week program for high school students; junior high students have

the option of an eight- or four-week session. We danced from 9:00 a.m. until 5:00 p.m. with only an hour off for lunch. All dance students take a rigorous schedule: ballet and modern dance classes every day and pointe and jazz classes every other day. The variety of classes gives dancers the ability to switch dancing styles easily, a definite asset when looking for a job later in life. And the difficulty of the classes ensures technical improvement: my jumps developed a more obvious *balon*, or bounce, and my turns became less forced.

Classes are demanding, but they are not the only challenge at dance camp: dancers also have a full schedule of rehearsals throughout the day. For example, I was part of the Interlochen Summer Dance Ensemble, which performed *Les Sylphides*, a romantic ballet. After learning the history of the ballet, we had to learn how to develop a character. Sylphs are ghosts, so we worked to make our movements as fluid as possible to communicate an ethereal quality to the audience. *Les Sylphides* also features a lot of corps de ballet work, which requires individual dancers to mesh into one body of movement. In rehearsals and in the final performance, I could see how much we all had grown as artists and technicians.

All this sounds like a lot of work, but dance camp is also a lot of fun. Interlochen is a beautiful wooded area in northern Michigan, and campers go on recreational trips to places such as the Sleeping Bear Dunes. Even on campus, dancers do a lot more than just dance, attending orchestra and band concerts, plays, musicals, and art openings that feature students from Interlochen's other divisions. In fact, dancers interact daily with artists from the other

divisions and share cabins with students who may paint or play violin as their major.

Interlochen's summer dance program isn't for everyone. It's intense, and if you aren't passionate about dance, you won't have a good time. But if you love to dance and are willing to work, a summer program like this is an excellent choice. You'll be a different and better person—and dancer—afterwards; I know I was.★

Maggie Bergeron, from Argyle, MN, recently graduated from Interlochen Arts Academy with a major in dance. She is continuing her dance training at Mercyhurst College while pursuing a B.A. in dance. She hopes to return to Interlochen as an intern next summer.

### Interlochen Arts Academy

Interlochen Arts Academy offers pre-professional training in the arts as well as a challenging college-preparatory education for students in grades 9–12, with a post-graduate year available. Students major in academics, dance, music, theater arts, visual art, or creative writing while also exploring the interrelationships between the arts and academics.

Interlochen's Art Camp is a residential program for students in grades 3–12. In four- and eight-week sessions, students study music, theater arts, dance, creative writing, or visual art.

For more information:  
Interlochen Center for the Arts  
P.O. Box 199  
Interlochen, MI 49643  
(616) 276-7472  
[www.interlochen.org](http://www.interlochen.org)



# North Carolina School of the Arts

by Kirstyn Brownson

WHEN I DECIDED AT THE END OF MY sophomore year that I wanted to pursue a professional ballet career, I knew that I needed more hours of training than I could get at my local dance studio. But I also didn't want to sacrifice my education. I decided to attend North Carolina School of the Arts because it allows me to continue my academic studies while taking a rigorous schedule of ballet classes and pursuing numerous performing opportunities.

My weekday schedule includes both academic courses and dance classes (except on Wednesdays, which all NCSA high school students devote entirely to their art). A typical day for me begins at 6:45 a.m., when I roll out of bed, my muscles contracted from the previous day's dancing. I shower, stretch, and race to breakfast before my 8:00 class. I securely wind my hair into a bun between Italian and History, after which I rush to the ballet studio to warm up for my hour-and-a-half technique class.

After this exhausting class, I tape my toes and cram my swollen feet into pointe shoes. The daily hour-long pointe class builds strength and precision through the execution of intricate pointe combinations, but we also occasionally learn a classical variation. After pointe class I doctor new blisters, stretch my muscles, check my mail, and hurry to the cafeteria to grab lunch, which I eat during Pre-calculus and AP English. At 3:35 I return to the dance studios for my weekly hour-and-a-half pas de deux class, which teaches partnering skills necessary for a professional dance career. After class I have just enough time to eat dinner, lift weights in the fitness center, and get to evening rehearsals.

Tonight—and throughout October, November, and December—I have rehearsal for *The Nutcracker*, which we perform 20 times each year in Winston-Salem and Raleigh. Some of my most memorable experiences at NCSA have occurred during rehearsals for this ballet: practicing the "Party Scene" on Saturday mornings, watching my teacher gracefully demonstrate "Snow" in high heels, and

swaying in sync with 30 other dancers to the beautiful notes of "Waltz of the Flowers." In addition to increasing strength, stamina, and artistry, these hours of rehearsal also foster camaraderie and lasting friendships.

Performing experience contributes enormously to a dancer's artistic development, and students at NCSA have many opportunities beyond *The Nutcracker* to perform. Last year, for example, several students were selected to dance in the corps de ballet for *Western Symphony* at Carolina Ballet's gala performance. We felt like a professional ballet company as we loaded a bus to Raleigh, danced a matinee and evening performance alongside stars of New York City Ballet and American Ballet Theatre, and returned to NCSA at one in the morning.

I have no doubt that I made the right decision in attending this full-time arts school. NCSA provides both the academic course work that will prepare me for college, and the technical and artistic training I'll need as a professional dancer. The challenges I've found here have helped me to grow as a whole person. ★



Kirstyn Brownson, from Tulsa, OK, has been studying ballet for 11 years. Now in her senior year at NCSA, Kirstyn plans to attend college while continuing to train for a career in dance.

## North Carolina School of the Arts

North Carolina School of the Arts trains talented young artists in dance, design & production, drama, filmmaking, and music. A campus of the University of North Carolina, NCSA awards undergraduate and graduate degrees as well as high school diplomas.

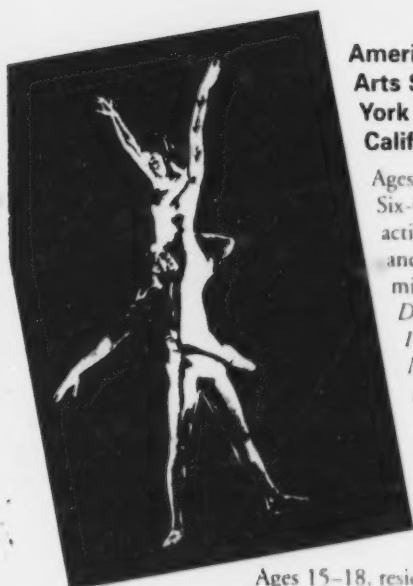
NCSA admits high school students to programs in dance, music, drama, and visual arts. Students earn a high school diploma by following the academic curriculum prescribed by the state of North Carolina in addition to satisfying departmental requirements for their arts concentration. Many students who complete their high school studies at

NCSA can fulfill their undergraduate requirements in less than four years.

NCSA also offers five-week summer sessions in dance, music, drama, filmmaking, and visual arts for high school students. Age and admission requirements, fees, and tuition vary by program.

For more information:  
Admissions  
North Carolina School of the Arts  
1533 S. Main Street  
Winston-Salem, NC 27127-2188  
(336) 770-3291  
[www.ncarts.edu](http://www.ncarts.edu)

# SELECTED SUMMER PROGRAMS



## **American Academy of Dramatic Arts Summer Program, New York City and Pasadena, California**

Ages 14 and older, commuter only. Six-week session in dramatic arts: acting, voice and speech, singing and movement, dance (jazz), mime, and musical theater.

*Director of Admissions, AADA/East, 120 Madison Avenue, New York, NY 10016; (800) 463-8990 OR Director of Admissions, AADA/West, 300 N. Halstead Street, Pasadena, CA 91107; (800) 222-2867; [www.aada.org](http://www.aada.org)*

## **Boston University Tanglewood Institute**

Ages 15-18, residential. Three- or six-week sessions in orchestra, composition, piano, and vocal music. Seminars and workshops available for various individual instruments.

*Boston University Tanglewood Institute, 855 Commonwealth Avenue, Boston, MA 02215; (617) 353-3341; [www.bu.edu/sfa/affiliated/tanglewoodmusic.html](http://www.bu.edu/sfa/affiliated/tanglewoodmusic.html)*

## **Boston University Theatre Institute**

Grades 10-12, residential and commuter. Six-week session emphasizing theater, vocal music, and creative writing.

*Boston University Theatre Institute, Boston University, 855 Commonwealth Avenue #470, Boston, MA 02215; (617) 353-3390; [www.bu.edu/sfa/affiliated/theatre\\_institute.html](http://www.bu.edu/sfa/affiliated/theatre_institute.html)*

## **Bowling Green State University Summer Music Institute**

Grades 7-12, residential and commuter. Nine one-week sessions in vocal and instrumental music (including jazz), recording, and musical theater.

*College of Musical Arts, Bowling Green State University, Bowling Green, OH 43403; (419) 372-8654; [www.bgsu.edu/colleges/music/events/](http://www.bgsu.edu/colleges/music/events/)*

## **Carnegie Mellon University Pre-College Program in the Fine Arts**

Ages 15-17, residential and commuter. Six-week session in theater, dance, music, TV/video, and visual and graphic arts. *Pre-College Program, Office of Admission, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213-3890; (412) 268-2082; [www.cmu.edu/enrollment/pre-college/](http://www.cmu.edu/enrollment/pre-college/)*

## **Interlochen Arts Camp**

See page 8.

## **Michigan Technological University Summer Youth Honors Orchestra Program**

Grades 9-12, residential only. One two-week session offering intensive daily rehearsals, master classes, and workshops with professional musicians.

*John Lehman, Youth Programs, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295; (906) 487-2219; [www.yth.mtu.edu/syp/hop.html](http://www.yth.mtu.edu/syp/hop.html)*

## **New York University Tisch School of the Arts Summer Drama Program**

Grades 11 & 12, residential only, limited to 16 students. One four-week session in the dramatic arts: Lee Strasberg Theatre Institute or Musical Theatre Program.

*Summer High School Programs, Tisch School of the Arts, 721 Broadway #1247, New York, NY 10003-6807; (212) 998-1811; [www.nyu.edu/tisch/summer/highschool.html](http://www.nyu.edu/tisch/summer/highschool.html)*

## **North Carolina School of the Arts Summer Session**

See page 9.

## **Sewanee Summer Music Center**

Ages 12 and older, residential only. One five-week session in orchestra and chamber music, conducting, composition, and theory.

*Leo Saguiguit, University of the South, 735 University Avenue, Sewanee, TN 37383-1000; (931) 598-1225; [www.sewanee.edu/ssmc](http://www.sewanee.edu/ssmc)*

## **Shenandoah Conservatory Performing Arts Camp**

Ages 12-18, residential and commuter. One two-week session in mixed chorus, band, strings, piano, harp, dance, and full orchestra.

*Sharon Pollard, Shenandoah University, Winchester, VA 22601-5195; (540) 665-4602*

## **The University of the Arts Pre-College Summer Institute**

Ages 15-18, residential and commuter. Two-, three-, four-, and six-week sessions in the media arts/writing, musical theater, visual arts, and jazz performance.

*Pre-College Programs Office, The University of the Arts, 320 South Broad Street, Philadelphia, PA 19102; (215) 875-3355; [www2.uarts.edu/pcuarts/si.html](http://www2.uarts.edu/pcuarts/si.html)*

## **University of Iowa High School Drama Workshop**

Grades 9-12, residential and commuter. Two-week session in acting, movement, improvisation, writing, and stage-lighting technique.

*Theater Arts Department, University of Iowa, Iowa City, IA 52242; (319) 335-2700*



# IN THE PERFORMING ARTS

## University of Maine Summer Youth Music

Grades 7–9 (junior program) and grades 9–12 (senior program), residential and commuter. One-week junior program and two-week senior program offering theory, music listening, music history, guitar, improvisation, and conducting, as well as lessons in woodwinds, brass, and voice.

*MSYM, Class of 1944 Hall, University of Maine, Orono, ME 04469-5788; (207) 581-1232*

## University of Oregon Summer Music Institute

Grades 7–11, residential and commuter. One-week sessions: Solo Vocal Workshop, Band Camp (symphonic and jazz), Jazz Improvisation Camp, Color Guard Camp, and Drum Major and Leadership Camp.

*Oregon Summer Music Camps, School of Music, University of Oregon, Eugene, OR 97403-1225; (541) 346-5670; [music1.uoregon.edu/LowGraphics/LGOSMI.html](http://music1.uoregon.edu/LowGraphics/LGOSMI.html)*

## University of Wisconsin–Madison Summer Music Clinic

Grades 6–12, residential only. Two one-week sessions in band, orchestra, choir, musical theater, jazz choir, and jazz ensemble. *University of Madison–Wisconsin, 5560 Humanities, 455 North Part Street, Madison, WI 53711; (608) 263-2242*

## SELECTED COMPETITIONS IN THE PERFORMING ARTS



### ARTS: Arts Recognition and Talent Search

Grade 12. Students submit audio tapes, videotapes, slides, or writing samples with their application packet. Top candidates in each of eight categories—Dance, Music, Voice, Jazz, Theater, Photography, Visual Arts, and Writing—receive an all-expense-paid trip to ARTS Week in Miami, where they take part in master classes, workshops, performances, and exhibitions.

Outstanding

applicants earn nominations to the

White House Commission on Presidential

Scholars, consideration for scholarships, and cash awards of up to \$3,000. \$35 entry fee per category.

*National Foundation for Advancement in the Arts, 800 Brickell Avenue, Suite 500, Miami, FL 33131, (800) 970-ARTS; [www.nfaa.org/arts.htm](http://www.nfaa.org/arts.htm)*

## Donna Reed Foundation Scholarships

Grade 12. Students submit an application and videotapes or audio tapes. Three finalists in each of five divisions—Acting, Musical Theater, Vocal Music, Instrumental Music, and Dance—receive all-expense-paid trips to the annual Donna Reed Festival and Workshops for the Performing Arts. There, students study with and perform for industry professionals and compete in a live performance for the \$4,000 scholarship awarded in each division. \$30 entry fee for first category, \$20 each for additional entries.

*Donna Reed Foundation, Scholarship Division, 1305 Broadway, Denison, IA 51442; (800) 336-4692; [www.frii.com/donna\\_reed/html/dr03\\_scholar.html](http://www.frii.com/donna_reed/html/dr03_scholar.html)*



## Music Teachers National Association Competitions

Elementary, junior high, and high school students of MTNA members. Winners of district and state competitions in Composition, Vocal Music, Instrumental Music, and Chamber Music progress to national competitions, which award prizes ranging from \$200–\$1,500. Deadlines and application fees vary by state; see the June/July issue of *American Music Teacher* for annual guidelines.

*Music Teachers National Association, 441 Vine Street, Suite 505, Cincinnati, OH 45202-2814; (513) 421-1420; [www.mtna.org/competitions.htm](http://www.mtna.org/competitions.htm)*

## National Federation of Music Club Awards

Ages 16–22. Competitions in Instrumental Music, Vocal Music, Theory, and Composition award scholarships ranging from \$10 to \$10,000. Send \$1 and SASE to receive NFMC's ten-page scholarship and awards chart. This chart also lists entry fees and deadlines.

*National Federation of Music Clubs, 1336 North Delaware Street, Indianapolis, IN 46202; (317) 638-4003*

## For additional competitions, see

*[www.kunrest.com/events/playersmain.html](http://www.kunrest.com/events/playersmain.html)*

and

*[www.classicalinsites.com/live/conserva/connect/su\\_competit.html](http://www.classicalinsites.com/live/conserva/connect/su_competit.html)*

## For a great survey of music on the Web, see MTNA's Music Hotlinks:

*[www.mtna.org/otherlin.htm](http://www.mtna.org/otherlin.htm)*

## And for links to a variety of dance and theater sites, visit Theatre Central at

*[www1.playbill.com/cgi-bin/plbl/central/cmid=star](http://www1.playbill.com/cgi-bin/plbl/central/cmid=star)*

# Zelda in Telluride

by Catherine Keyser

*Zelda was a character struggling to get out of my mind and onto paper. She liked Jim Morrison's music. She wrote poetry and loved to read. She was 17 and living with AIDS. The more I wrote, the more real she became. In my imagination, a person had been born, and both in my play and in my life, Zelda was determined to make a name for herself.*

A COUPLE OF YEARS AFTER I WROTE A play about Zelda, I submitted it to the Scholastic Writing Contest. I was thrilled when *Zelda* was one of ten plays in the country to win a Gold Award in the drama category, and even more excited to learn that these ten plays were also read by the Sheridan Arts Foundation. This group then selected three playwrights to fly to Telluride, Colorado, to have their plays read at the Sheridan Opera House during the week-long theater festival. My play was chosen for the reading—and *Zelda* and I were off to Telluride!



## From Finished Play to Work in Progress

When I told Vincent and Stephen, the other winning playwrights, that my play was about a girl with AIDS and her relationship with the boy who volunteers to keep her company, Vincent asked, "Do you always write cause plays?"

I tried to explain to him what inspired me to write the play in the first place. *Zelda* was an attempt not to address all the issues involved in the AIDS epidemic, but to communicate the specific situation of a teenage girl who tries to cope with her fears by pushing others away. For me, playwriting has always been a process of connecting with a character, of depicting the perspective of an individual. Approaching *Zelda* as an "AIDS play" would have emptied the characters of their individuality.

During the next couple of days, I addressed more questions about my play when Vincent, Stephen, and I attended a playwriting workshop. We critiqued our work under the guidance of Karin Cooper, whose play *Three Mashas* was performed in the festival. Karin saw a great deal of potential in my play's characters, but also noticed that my play was slightly unbalanced. Because of my love for *Zelda's* character, I made her relationship with Brian, her volunteer companion, too one-sided. Brian did not seem to contribute as much to *Zelda's* life as she did to his.

But there was a solution. The trick, Karin showed me, was to avoid staticism in characters. Brian's character didn't change over the course of the play, in part because there was no conflict between him and *Zelda*. The crux of every play is a conflict, so in order for the play to be truly moving,



Karin suggested, a conflict would have to exist between *Zelda* and Brian.

I received more feedback on *Zelda* at the end of the week when our plays were read to an open audience that consisted of both the festival's performers and interested locals. Vincent and Stephen's play was read by actors who were participating in the festival, but because my play is about teenagers, the organizers of the festival recruited local high school students to read *Zelda*. Afterwards, audience members were invited to comment on the plays.

After the playwriting workshop and the reading, I had many ideas about the direction my play could take. For example, I saw how I could incorporate *Zelda's* family life into the play, making for richer relationships

*The plays Catherine saw in Telluride, including Wright from America (left) and Three Mashas (above), taught her that "theater is about more than words." Photos courtesy of Telluride Repertory Theater Company.*



between characters. While I was reassured that I had portrayed Zelda as the fascinating person I thought her to be, after Telluride I realized that the other characters in this play held just as much potential for development in her story. *Zelda*, which I had originally considered a finished script, had become a work in progress.

## More Than Words

The actor Keith Carradine and his wife started the arts foundation in Telluride to promote education about theater and the development of new theater in all its forms. During my time in Telluride, I saw many forms of theater that shed light on my own work.

For example, one day we attended an acting workshop with the Kadmus Theater Company, which emphasized movement and vocal techniques instead of text. On the first night of the festival, we watched the Kadmus players (two women dressed all in black) perform a Greek tragedy unlike any I had ever seen. The women would lean over and waddle around the playing space—it was performed in theater-in-the-round—looking more like ducks than great tragedians. They lay down on the floor and stepped on one another, and sometimes merely moaned, bellowed, and wailed instead of saying the words. When they recited dialogue, the women distorted the pitch and volume of their voices, so that the words were difficult to understand.

This fascinating piece helped teach me that theater is about more than words—I saw that it is also about the energy beneath the words. All the plays I watched that week (including *Wright from America*, *Three Mashas*, and a modern dance and theater piece based on the works of Hildegard von Bingen) showed me how energy can be created through non-verbal expression. As a writer, I needed to provide the actors with opportunities to reveal emotions, not just to speak. For example, although *Zelda*'s dynamic wordplay was important in my play, I had to avoid relying on her intelligence and wit alone. By creating situations that would allow *Zelda* to *show* her vulnerability and honesty, I would give an actor more substance to work with when performing that role.

Perhaps the most rewarding part of the Telluride experience was working with and talking to the people in the arts foundation

and people involved in the repertory theater. I met people who had lived incredible lives immersed in the arts, and they all had stories to tell (about working on a play with Patrick Stewart, or about the black cat that lived under the outdoor stage where the Telluride company performed *Macbeth*). These people gave me a colorful view of life in the arts, and the enthusiasm with which they described their work strengthened my desire to become a professional writer.

While I was in Telluride, I didn't meet any celebrities, and I didn't write the next great American play. I spent a lot of time just reading and thinking and watching. But while I was there, I learned so much

about the craft of writing, and even more about a character I thought I already knew. I had flown halfway across the country to find so much possibility in my work, all because of this person I had made real. Thank you, *Zelda*. ★

Catherine Keyser, now a sophomore English major at Princeton University, has won awards for several of her plays. Two of her plays, *Beautiful Girls* and *The Fiance*, have been published by Baker's Plays in Boston. Catherine hopes to become a professional writer.



## EXCERPT FROM ZELDA:

(Mrs. Scott is about to exit stage right when Brian enters in jeans and a sweater and knocks on the door.)

MRS. SCOTT: Oh, that must be ... (She takes a letter out of her pocket and opens it, looking for the name.) Brian! Brian Baxter. (Zelda groans.)

ZELDA: Oh, God. It's the Boy Scout. I can't believe you're doing this to me, Mom.

MRS. SCOTT: You need company, Zelda.

ZELDA: Who says? (Brian knocks again. Mrs. Scott runs to the door and opens it.)

BRIAN: Mrs. Scott?

MRS. SCOTT: Yes?

BRIAN: Mrs. Scott? I'm Brian Baxter. I'm from Redvale High School Key Club—

MRS. SCOTT: Oh, yes, Brian. Come in, come in! Zelda's in the living room. (Zelda coughs again, this time for dramatic effect. Brian seems a little nervous as he enters.)

BRIAN: Hi. I'm Brian Baxter. Are you Zelda? (Zelda pretends to be exhausted and drops her book on the floor.)

ZELDA: Oh, dear, me! I just can't seem to ... (Zelda pretends to struggle to reach for the book. Brian scrambles to get it for her.)

BRIAN: Here you go. (Zelda grabs his hand; Brian is petrified.)

ZELDA: (melodramatic) Brian, can you do this one last thing for me before I expire here on the couch?

MRS. SCOTT: Zelda! Spare the boy this nonsense.

BRIAN: (stammering) What ... What is it, Zelda? (Zelda sits up.)

ZELDA: (her normal self) Get that stupid look off your face and talk to me normally! I'm not going to die while you're here watching, though that would be rather more interesting, don't you think?

# MASQUERADING WITH SUPERHEROES I

## The 56th World Science Fiction Convention

I HAVE WANTED TO BE A SCIENCE FICTION fan since 1977, the year I turned ten and my brother gave me a blue v-neck shirt just like the ones worn by the crew of the *USS Enterprise* in *Star Trek*. My brother and I were toddlers in 1969, when the original television series ended its three-season run in prime time. But during the 1970s, *Star Trek* reruns attracted legions of new fans from our generation, and by 1977 Captain James T. Kirk and Dr. Spock were icons of pop culture. With the glittering *Star Trek* insignia, my birthday present was a fashion statement that would tell the world: *this kid's cool*.

Until I outgrew the shirt a year later, I wore it to special events like Orioles games, birthday parties, duckpin bowling. But I hardly ever watched the show. The opposite of my brother, Billy, I could not get beyond the jargon. In fact, in the 21 years I've wanted to be a science fiction fan, I've only read *The Hobbit*, which was required summer reading. I haven't even seen *Blade Runner*.

Today the hip and intellectual series I can't relate to is, of course, *The X-Files*. With all the hype surrounding the movie this summer, I started to think there was something really wrong with me. Was I the only person in the universe who didn't care about Mulder and Scully's files? While I passed on the film, I welcomed the chance to cover the 56th World Science Fiction Convention (Worldcon) for *Imagine* in August: I would resolve my science fiction issues and walk away a fan.

### Readings, Writers, RoboCop

From the 97-page schedule on the Web site, I learned that the five-day event included panels, readings, and movie discussions. I also learned that "fan" is the technical term for an enthusiast who does more than read or watch science fiction.

Typically, fans attend "cons," the science fiction conventions that take place somewhere in the U.S. every weekend.

I went expecting to see aliens and Jedi knights, but I nearly dropped my registration form in disbelief when a woman dressed as Xena walked by the Internet Lounge. The warrior princess's provocative leather outfit with gold detailing, arm bands, and knee-high boots set a high standard for the afternoon.

I had arrived in time for a panel on professional and fan writers. Many fans who

attends many cons and always dresses up. "I work in the medical community, which is very serious, so this

is the lighter side of my life," he told me. David then brandished his futuristic weapon for a small crowd of photographers.

Like David, the Logan family had been posing for photographs since they walked through the door as superheroes. "We never get very far," said Trystan, 14 (Superboy). The parents, Frank (Superman) and Gina (Wonder Woman), have been wearing homemade costumes to cons for years, but this was the first with the children. When I lifted my camera, though, all six struck poses like so many supermodels.

The Logans are minor celebrities at home in New Jersey. "We attended all the special edition *Star Wars* openings as characters," said Talia, 12 (Wonder Girl). "And they always gave us free tickets," added Jessica, 13 (Supergirl). The real hero, however, was 11-year-old Nickolas as the comic book character Impulse. "He's totally dedicated," said Gina, who shaved her son's head in the hotel room Friday morning. "My hair was too short for me to be Impulse as he usually appears," said Nickolas, "but, luckily, he's bald at one point."

### "Different Is Good"

Like most fans, Elizabeth Griffen was dressed in street clothes. But her black knapsack was covered with science fiction buttons, including a large, round one with "Elizabeth" printed above a black-and-white drawing of a winged fantasy creature. Encouraged by her parents, who are into science fiction role playing, the 13-year-old



themselves write come to cons to talk about the craft with published authors. The accessibility of authors, who attend panels and socialize with fans, seems unique to science fiction. One author said the tradition can make for unlikely encounters: "I ran into a fan recently who picked up a conversation he had begun at a con four years earlier—as though no time had passed." Another author on the panel declared, "We're all fans! We're all fans!"

Leaving the panel, I noticed RoboCop talking to three of Darth Vader's lieutenants across the room. RoboCop turned out to be David Zaritsky of Princeton, New Jersey, who

from Pennsylvania started reading science fiction a few years ago. "I thought it might be different," she said, "and different is good." Today she reads science fiction to escape reality. "I'll live in the real world when I grow up, but right now I'm going to leave it when I can," she said.

Elizabeth told me that her buttons came from "the freebies table" in the so-called "Dealers Room." This room, which I'd been hearing about, was actually an area. A bustling science fiction bazaar the size of a small city block, the Dealers Room consisted of aisles lined with booths and tables. Dealers were selling books, art, clothing, crafts, and things for which categories don't exist.

The Dealers Room revealed the diversity of science fiction: I went from hugging a whimsical stuffed dragon that any child would cherish to admiring hunting knives with hand-carved Gothic handles. All around me people were poring over tables of new and used books and comics in plastic sleeves; trying on jewelry and ornate Mardi Gras-style masks decorated with ribbon and feathers; and selecting fabric for custom-designed medieval costumes. The dealers had been hawking their wares for three days straight, but they were clearly energized by the fans.

### The Science in Science Fiction

I stopped at the Artemis Project booth for a virtual reality view of the lunar landscape. The booth was decorated with stunning color images of space and the moon, and a flyer teased: "Find out how private enterprise will put you on the moon!" While I waited, one of the project's founders, Dana Carson, described the mission: to establish a permanent, manned lunar base and develop commercial flights to the moon, making space travel accessible to private citizens. "To be viable," he said, "space travel will, of course, have to turn a profit." Founded in 1994, the project is a commercial venture in the research stage,

and the project's findings are available on their Web site ([www.asi.org](http://www.asi.org)).

### Making Artemis a reality may take time,

but it's not science fiction. "The technology exists," said Dana. "If we had the money we could be on the moon with a permanent base in two years." But funding will have to come from the private sector, so the Artemis team was at Worldcon to spread awareness and sell project-related items. I finally donned the virtual reality helmet, and as Elizabeth Griffen might have said, it was different. Far more exciting, however, were

the vision, creativity, and can-do attitude of the project itself.

Hard science was everywhere at Worldcon. Panels that afternoon focused on topics like transplant technology and 3-D images of Mars, and representatives from NASA were on hand to distribute literature and answer questions. I asked Ian Strock, the publicity director of the Artemis Project who is also a fan-writer, about the role of hard science in science fiction. "One school of thought holds that stories should be based on—or easily extrapolated from—scientific fact," he said, "while the other argues that a good story matters most and scientific fact is secondary." In his own writing, Ian works hard to get the science right. "The science is key because the stories are about what might be, what we can invent, what we can do," he said.

### Come for Science Fiction. Stay Up All Night

To rest my brain, I sat down at a table outside the Dealers Room with Gwen Carson, 15, and Maureen Reddan, 16, who

were listening to folk, or science fiction folk singing. "I come mostly for the folk," said Gwen, who lives in Maryland. "A lot of the songs are based on books and poems by science fiction authors." As we talked, a four-person band in medieval costumes sang and played string instruments.

Gwen and Maureen are cousins and have been to several cons with their families, including the 1995 Worldcon in Glasgow, Scotland. Maureen, who is from Colorado, said that "interesting people" are the reward for traveling to faraway cons: "People here aren't afraid to be different—most don't believe in the word 'normal.'" She also said that cons are about much more than science fiction. Gwen, who will be in Melbourne, Australia, for the next Worldcon, agreed: "Some people stay up all night talking in the hotels—and you can be sure that they're talking about everything under the sun."

I asked Gwen and Maureen if they were going to The Masquerade, the elaborately staged costume competition that night. They couldn't because they worked as babysitters in the evenings, making money

they usually spent at the con. Before taking a final lap around the Dealers Room, I told Gwen that I would love to catch up with her next August at Worldcon '99 Down Under. I really would.

I CAUGHT UP WITH THE Logans by phone to hear about The Masquerade. The family came on stage in darkness, Frank said, struck a pose, then appeared in silhouette against a blue background. The lights came up and speakers

blared the second verse of the Matchbox 20 song *Real World*: "I wonder what it's like to be a superhero, I wonder where I'd fly if I could fly around downtown..." As the front man, Superman strutted while Wonder Woman, Wonder Girl, Superboy, and Supergirl performed choreographed dance steps. Impulse sped around the stage the entire 30 seconds. "Just like in real life," Gina said. "Nickolas is Impulse." They took home the prize for Best in Novice Division, and when we spoke, their next big gig was Halloween. ☿



# LIVING ONE TAKE AT A TIME

by Ted Winstead

When Leonardo DiCaprio dropped out of the movie *Primal Fear*, Paramount Studios conducted a nationwide search to fill his role, that of Aaron Stampler, a two-faced choirboy from Appalachia. The film's producers and its star, Richard Gere, knew that without the right actor to play Aaron, the legal thriller was dead in the water. In 1995, after casting directors had passed on more than 2,000 candidates, an off-off-Broadway theater actor named Edward Norton auditioned in character, using a Kentucky twang (honed during repeated viewings of *Coal Miner's Daughter*) and phony bio to convince Paramount that he actually grew up there. A short time later the movie's duped-but-relieved producers hired Norton, a Yale grad from Columbia, Maryland, who knew he'd landed a career-making role.

Months before *Primal Fear* hit theaters, copies of Norton's electrifying screen test generated considerable buzz in Hollywood. Within a year he was working with A-list directors Milos Forman (*The People vs. Larry Flynt*) and Woody Allen (*Everyone Says I Love You*). With two films, *Rounders* and *American History X*, out this fall, the 29-year-old actor talked about his craft by phone from Los Angeles.

**You've said that you don't want to play characters that ten other actors could play. What do you look for in a role?**

The fun of acting for me is the chance to realize different sides of myself and to dip into ways of thinking, talking, being, and behaving that are not my own. Acting's almost a way of making entirely different choices with your life, but without any of the real consequences of making those choices. I enjoy getting out of myself and going over into someone else's reality, so that informs my hunt for roles. I tend to stay away from characters that don't challenge me to transform myself by doing things like altering my physical appearance or using a different voice.

**How do you get to know your characters so that you can become them on film?**

Well, it's pretty simple—it's essentially a research project. Ninety percent of what you learn may never reach the surface of the performance in any specific sense. But the performance is much more true when you become deeply immersed in a character beyond what's required by the script. Your gut reactions are instinctive, and you're more likely to get what the director Milos Forman calls "the unrepeatable moments," which is when something happens that is not necessarily scripted, and you respond truthfully.

**What kind of research did you do for *Rounders*, the recent film about professional poker players?**

I got coached by the top poker players in the country for two months, going nightly to legal and illegal back-room card games in Los Angeles, New York, Atlantic City, and Las Vegas. My character was a cheat—what they call a mechanic—so security consultants to the casinos (most of whom had been indicted for hustling) schooled me in all the different poker cheating techniques. It's a ball to have the professional excuse to spend that kind of time learning the game, and again, the research pays off in improvised lines and improvised

moments that you and the other actors and the director discover.

**Are there similar opportunities for actors to improvise during the rehearsing of a play and while shooting a film?**

It depends on the situation, but actors and directors working in theater have enormous respect for the playwright, and I have never been in a production where people were changing things or improvising. Now if you're doing a well-known play, it seems logical that you are not going to mess around with the lines. But this was also



After his Oscar-nominated performance in *Primal Fear* (above), Norton was flooded with offers to play disturbed young men, but he chose instead diverse roles that would demonstrate range.



true when I did a new play with Edward Albee, who was sitting in rehearsals and rewriting almost daily. There is still a degree of spontaneity on stage, however, because every night you're looking for ways to make things fresh and find new moments.

There's not nearly as much hewing to the script in the process of making movies, because, in general, authorship in film falls to the director. In theater, even though a play may feature a prominent director, it's still a Neil Simon play.

I think the power dynamics of the medium are another reason for this. In film, directors have more power, and actors—especially big-name actors—often have a lot of power, too. The way films get made also shapes the process. Films are big financial productions that often get rolling even before the scripts are fully developed. So writers, directors, and actors all work together, continually developing the script even into the process of shooting. Generally speaking, a film is a work in progress all the way through.

*What are the dynamics like on a movie set? How do you approach working with a director and other actors?*

Ideally, you have a relationship with other people, especially with the director, that's mutually admiring, respectful, and collaborative. Someone once said to me—and it is really true—that the best and worst thing about films is that they're collaborative. The down side is that there are too many people involved on too many levels. Beyond writers, actors, and directors, there are cinematographers, lighting people, production design people, casting directors, and so on—all working from different angles to realize the same goal.

It doesn't always work, and sometimes I think that a good film is actually a miracle. The success of a project often depends upon the director's ability to articulate a vision. When it comes off, it's wonderful. That's the best part of doing films—to work on a creative project with so many people.

*Have you grown accustomed to having your work critiqued constantly while filming?*

I find that as an actor you have to offer yourself up as one of the tools for the director. You have to be willing to alter your idea about something on a dime. It's a process of experimentation. And so you have to be secure and as loose and available as possible. If a director wants to try it one way and then comes up and says, "It's still not

quite working for me, can we try this?" it's not a comment on your failure to achieve something—it's the process.

No one's ever going to nail it on the first take. Someone told me that Robert DeNiro isn't even warmed up until about six takes in, and then at ten takes in, he's starting to get really good, and then on take fifteen he's starting to get brilliant. The multiple takes become your rehearsal and your experimenting time.



*For Rounders (above), Norton was schooled in the art of cheating by casino security consultants who had been professional poker hustlers themselves.  
From left: Norton, Matt Damon, John Turturro*

*Do you miss acting in front of a live audience?*

Performing live is a much more magical, much more thrilling experience than performing on film. There's an intimate, direct relationship with other people; the audience fuels you and affects the performance. It's wonderful.

Making movies is a grind, to be completely honest. It's a very, very tiring, highly repetitive and highly fragmented process. You shoot very small bits of a two-hour film over three, four months minimum, and in a 12-hour day, there's probably less than an hour that's actually spent between "action" and "cut." You are not rolling film and acting; you're getting through make-up, waiting for the crew to set up lights, set their shot, rehearse camera moves.

*Given the process, why do you work in film?*

I find far more interesting stories and characters in film. I think the reason is that the pool of writing talent has migrated there from the theater. I would argue that film is the popular entertainment of our time as well as our most broad-based popular art form. It's accessible to people at all economic levels and is the most diverse in subject matter and story telling.

Even though I truly believe in the theater and am really moved when I see a play done well, I think that theater, especially in New York, has priced itself out of the reach of the average audience. So while plays are fun to do, I like the fact that the audience is wider and more diverse for film than it is for theater. I've gotten feedback that makes me feel like we're reaching people, whether the goal is just to entertain with something like *Primal Fear*, or to present more of a political message with something like *Larry Flynt* or *American History X*. And that's really appealing—anybody in the business who's says that they're not in it to try to create some sort of a reaction from people, well, that's just nonsense.

*Continued on page 18*

*How do you feel about playing the violent incarnation of Aaron Stamper in Primal Fear and the Nazi skinhead in American History X?*

I am drawn to these characters for the reasons we talked about earlier. The really memorable characters are often hyperbolic. They operate in ways that are so extreme that the characters are almost not believable—and on paper they might not be believable at all. But those characters get hauled down into reality by the power of the actor's truthfulness or talent. So, a character like Hannibal Lecter in *Silence of the Lambs*, who in many ways is an absurd portrait of a person, is so good because Anthony Hopkins makes him a horrifyingly real creature.

The challenge for an actor is to operate in this loopy kind of territory and create believable characters. Certainly that was the fun of *Primal Fear*. Here's a totally ridiculous idea that this person has a split personality—you know, good on one side and bad on the other. Done the wrong way it is a really cheesy television movie of the week, but, if you can find the way to bring it to life in a way that doesn't make people groan, then you've got something exciting.

Someone once said about playing Hitler: you can't play Hitler as others perceive him. You have to play Hitler as he perceived himself, because Hitler didn't think of himself as monstrous. You have to get inside his mentality, and that's always fascinating.

*While you were growing up, did you devote yourself to mastering your craft?*

No, I never did only acting, and I think that's made me better at it. Even though I started taking acting classes at age five and was very serious about it all through high school and college, I did not live my life around the pursuit of acting until I was out of college.

Life experience is a big part of the preparation for this profession. As an actor, you have to be a sponge, constantly absorbing experiences and people. I think you can be a terrific actor at 21—but not that terrific. When I've had the chance to talk about this with actors I've always admired, they've said similar things. Actors like Dustin Hoffman, Robert DeNiro, Anthony Hopkins—they're people with such rich lives outside the study and pursuit of acting.

*What did you study at Yale?*

I was a history major. I saw no benefit in an undergraduate theater degree, and I think that has been totally borne out. Everything I have ever learned in the theater I was able to learn in the context of

actually doing it after college. I'm so glad that I used my college years not to focus on theater, but to learn about a lot of other things.

*What do you say to young people who tell you they want to act professionally?*

I tell them what somebody once said to me: "If there's anything else you can imagine yourself doing and being happy, then you should do that." I figure anyone who hears that advice and plows on anyway is obsessed or committed in the way that you need to be. If they turn away, then they probably shouldn't continue with it.

There's not much work in this business and a lot of people who want to do it. I know very few actors who haven't had to hammer away at it for years and years. You hear people say, "If I'm really talented, I'll get there," but to succeed in this field you need the perfect combination of talent, luck, and timing, which of course is to some extent out of your control. But ultimately this shouldn't discourage someone who really loves to act; all meaningful experiences in life come with risks.

*What have you learned about fame and celebrity?*

I have an ongoing conversation with a friend about whether it's a sign of a culture's decline when society elevates clowns instead of leaders or teachers. We have a completely disproportionate reverence for entertainers in this country. The down side of this is what I see as the dehumanization of those entertainers; this occurs because the media circus that is forever chasing higher ratings and increased sales reduces the lives of entertainers to their most simplified form. As a celebrity, you become larger than life. And when

the public no longer perceives you as a real person, they sometimes invade your space in scary ways.

But it comes with the deal, and I haven't changed a single thing about the way I live my life. On the whole I get a very grounded reaction from people, and of course it's nice to have people respond to your work just as it is for someone who writes a good book or performs a successful operation.

*What would you do if you didn't act?*

Let's see, I'd probably do a lot of things. We do have a joke, though: How many actors does it take to screw in a light bulb? Answer: 100—one to do it, and 99 to say, "I could have done that so much better." So I'd probably sit around and talk about the parts that I could have done better. ★

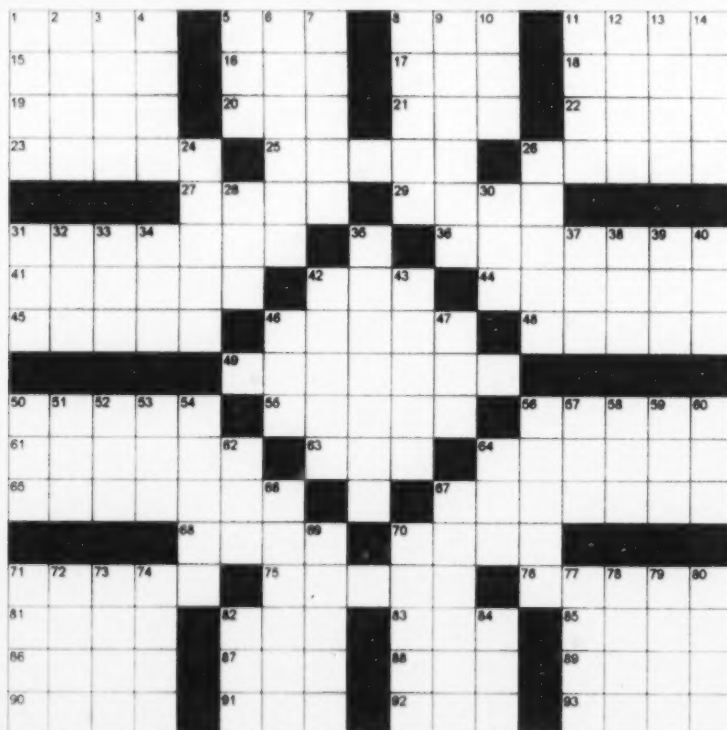


For his character in *American History X* (above), Norton lifted weights to add 30 pounds of muscle. After returning to normal weight, he shed 30 pounds for his current project, *Fight Club*, due out next year.

# WORD WISE

by Carol Blackburn

## Ars Longa, Vita Brevis



Constructed using Crossword Weaver

### ACROSS

- 1 Paris rendezvous
- 5 Hard-boiled
- 8 "\_\_\_ walks in beauty"
- 11 Indian song
- 15 Elliptical
- 16 Honest \_\_\_
- 17 Stroke
- 18 Hero
- 19 Opera superstar
- 20 OPQ followers
- 21 Singular
- 22 Like a violin string
- 23 \_\_\_-garde
- 25 Wit
- 26 Pace

### DOWN

- 2 Sow's companion
- 3 Orpheus's instrument
- 4 Advance screening
- 5 Hitchcock classic
- 6 Bird's-eye view
- 7 "What a tangled \_\_\_ we weave"
- 8 Author of the Constitution
- 9 Keanu Reeves movie
- 10 FAC or GBD
- 11 Granny Smith
- 12 \_\_\_ a l'après-midi d'un faune
- 13 Ernest Worthing's creator
- 14 Contaminate

- 15 Major and minor
- 16 *The Iceman* Cometh author
- 17 Make lace
- 18 Japanese violin prodigy
- 19 Wins affection
- 20 Javanese band
- 21 Shed a \_\_\_
- 22 High (Span.)
- 23 Portion of a play
- 24 All (Ital.)
- 25 Major division in a long poem
- 26 *To \_\_\_ and \_\_\_ Not*
- 27 Opposite of cresc.
- 28 Local network buffer (abbr.)
- 29 Record a sound track

- 86 Eternally
- 87 Globe
- 88 Beatrice and Benedict's business
- 89 Bill of fare
- 90 Jay \_\_\_
- 91 "Take arms against a \_\_\_ of troubles..."
- 92 Maple syrup
- 93 Brews

- 38 Puck
- 39 Set
- 40 Unrefined metal
- 42 Chaff's better half
- 43 Bear the \_\_\_
- 46 LCD's precursor
- 47 Insecticide
- 50 Sadness
- 51 Hotel
- 52 Conducted
- 53 Expire
- 54 Thrill
- 56 Imitate
- 57 Lyric poem
- 58 \_\_\_ drums
- 59 Epoch
- 60 Original \_\_\_
- 62 Local/regional editor (abbr.)
- 64 Door \_\_\_
- 66 Garry Trudeau's genre
- 67 The Good Witch of the North
- 69 Cuban dance
- 70 \_\_\_ *Shrugged*
- 71 *A Light in the Attic* author
- 72 Give in
- 73 Level
- 74 Roman fiddler
- 77 \_\_\_ mater
- 78 Winter holiday
- 79 Sound
- 80 Musical composition
- 82 Operating system
- 84 Be-\_\_\_

### DOWN

- 1 Musical tail
- 2 Spring, in Hebrew
- 3 Bean
- 4 Spirit
- 5 A musician must have a good one
- 6 'Enry 'Iggens's creator
- 7 Costume (2 wds.)
- 8 Thread holder
- 9 Shakespeare's warrior king
- 10 Summer, to Satie
- 11 Stravinsky dance
- 12 \_\_\_ Clayton
- 13 Ascend (2 wds.)
- 14 Singing voice
- 24 Chord
- 26 \_\_\_ nova
- 28 Moray
- 30 Ump
- 31 \_\_\_ de deux
- 32 Kind of theater company
- 33 Before (poetic)
- 34 Life, to Molière
- 35 Kind of harp
- 37 Savion Glover's talent

Solution on page 31.

Review by  
Lesley Mackay & Charles Beckman

**Lesley:** Many of us have dreamed of escaping to a serene, secluded spot, a place where we could simply get away from it all. One American writer had that thought, made it a reality, and wrote a great literary essay about his experience. In 1845, Henry David Thoreau, then 28, moved out of the small town of Concord, Massachusetts, and into a cabin he had erected on the banks of Walden Pond. There, he began writing his long essay *Walden; Or Life in the Woods*.

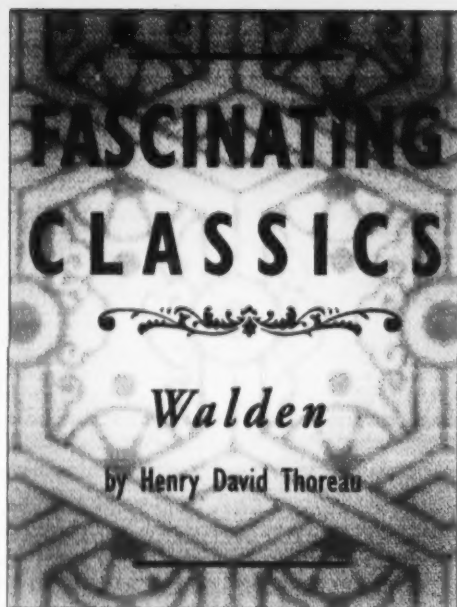
As you know, Chuck, this is the first time we have recommended an essay to our readers. *Walden* is not an easy read. It is full of references to religious texts, literature, and philosophy from around the world. It is also highly digressive, held together only by a structure loosely based on the four seasons.

But many scholars consider *Walden* the most seminal—that is, the most original and influential—American literary text. What do you think of it, Chuck?

**Charles:** I first read *Walden* in high school, and it had a great impact on me. I admired and even emulated Thoreau's decision to immerse himself in nature. After reading the book I sometimes wandered through the woods of a nearby state park, in search of epiphanies, or moments of great discovery. Years later, I still relate to *Walden*—to a degree. For example, my family does uphold some Thoreauvian ideals, such as living relatively simply. (In today's consumer culture, this is a constant challenge!)

I do find the book tough going in places, but I continue to appreciate Thoreau's ambitious dual agenda: to capture poetically the spirit and beauty of the natural world; and to urge readers to renounce materialism and to live simply in nature.

**Lesley:** And that dual purpose, combined with Thoreau's tendency to journalize, helps explain why the book is intensely persuasive in some areas and highly lyrical in others. On the surface it looks as though Thoreau tried to give structure and organization to *Walden*, dividing the work into chapters with different themes. In the first, "Economy," for example, he criticizes the middle-class existence beginning to take hold in New England and describes how he built his cabin, fed and clothed himself, and kept busy during 26 months



at the lake. In other sections, such as "Spring," he strings together lovely philosophical meditations on the natural world.

But Thoreau so often combines themes, styles, and rhetorical strategies that the chapters are far from being discrete entities. In *Walden*, as in nature, everything tends to run together.

**Charles:** Thoreau certainly made no secret of the influence nature had on his writing. But that's exactly what he had hoped for when he went to live at Walden Pond. Here's one of Thoreau's several explanations for his decision to live in nature:

*I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived. I did not wish*

*to live what was not life, living is so dear; nor did I wish to practise resignation, unless it was quite necessary.*

**Lesley:** I'm glad you picked out that passage, Chuck. As well as articulating why Thoreau chose to go off into the woods, the passage shows Thoreau's tendency to build arguments around dichotomies, or points of contrast. Here, he explicitly contrasts what he believes to be real life with other, lesser forms of experience. And he implicitly contrasts himself with other people who "practise resignation," living what is "not life."

These dichotomies resurface many times in *Walden*, coming together in one of the book's most famous statements: "The mass of men lead lives of quiet desperation." The subtext of this statement? I, Thoreau, am not desperate and will not be quiet about my own powerful life experience.

**Charles:** Thoreau is certainly contentious. In fact, I find his first section, "Economy," strident and difficult to get through—I bet it's kept a few readers from finishing the book. And yet, beyond that section, I encounter some of the most amazing writing I have ever read. In "The Pond in Winter," for example, Thoreau gives a lyrical description of ice-fishing for pickerel:

*They are not green like the pines, nor gray like the stones, nor blue like the sky; but they have, to my eyes, if possible, yet rarer colors, like flowers and precious stones, as if they were the pearls, the animalized nuclei or crystals of the Walden water. . . . It is surprising that they are*

### Henry David Thoreau: A Transcendentalist Writer and Activist

Along with other celebrated 19th century Americans, such as his mentor, Ralph Waldo Emerson, the feminist Margaret Fuller, and the educator Bronson Alcott (Louisa May Alcott's father), Thoreau was a Transcendentalist. Supplying the philosophical foundation—and much of the great writing—of the American Renaissance, Transcendentalists adapted the ideas of neo-Platonists and the German philosopher Immanuel Kant to articulate a new, North American idealism. Rejecting social institutions, they valued above all else the unseen—the

workings of principle and spirit.

Transcendentalism was grand—at times even grandiose. In their writings, both Emerson and Thoreau could lash out against common humanity. Yet, in its most realized form, this school of thought embraced ordinary men and women, with their enduring capacity for transcendence. Relatedly, proponents were among the most committed social activists of their day, educating children, informing the populace, fighting slavery, and helping to achieve women's suffrage.



*caught here,—that in this deep and capacious spring, far beneath the rattling teams and chaises and tinkling sleighs that travel the Walden road, this great gold and emerald fish swims. I never chanced to see its kind in any market; it would be the cynosure of all eyes there. Easily, with a few convulsive quirks, they give up their watery ghosts, like a mortal translated before his time to the thin air of heaven.*

**Lesley:** This is a beautiful passage, and, perhaps typically, a strange one. Thoreau goes from describing the beauty of the living pickerel to evoking their deaths at the hands of fishermen. Perhaps there is something remarkably honest about this.

**Charles:** In this case, you're right, although I'm not sure how much credit we should give Thoreau for honesty. Scholars believe that the foundation of this book is not factually solid. Thoreau's descriptions of his household economy and even of his very lifestyle have fallen into dispute.

The factual inconsistencies involve Thoreau's seclusion and finances. First, Thoreau's cabin was built not in the wilderness, but walking distance from Concord—not exactly the middle of nowhere. Second, Thoreau often went to town and dined at his friends' houses during his adventure; he may have disapproved of middle-class living, but he continued to enjoy it. Third, the accounts of his income and expenditures as reported in "Economy" seem to be inaccurate. I remember being disappointed when I read that this seemingly forthright man had fudged the facts upon which his great book rests.

**Lesley:** And yet, Thoreau was a remarkably principled man [Editor's note: see sidebar]. How do we account for the discrepancy between historical reality and Thoreau's written account? I think that the best way is to regard the text as primarily a literary one. We need to keep in mind that Thoreau felt obligated not only to write about his own experience, but also to create books that heralded the dawning of the American republic. Thoreau's idealism undoubtedly influenced the writing of *Walden*. It's not surprising that he was not always able to reconcile his visionary sensibility with the plain facts.

One critic, I think, expressed his perspective on the factual problems with *Walden* very well. According to Stephen Fender, "*Walden* is a series of exemplary narratives based loosely on the thoughts,

feelings, and conscientious meditations, more than the life, of its author." Professor Fender goes on to suggest that the "I" in *Walden* does not represent Thoreau himself, but someone more like a typical narrator in a fictional work.

**Charles:** I like that perspective, Lesley. When you consider all that Thoreau was trying to accomplish and that he did produce such an important literary and philosophical text, it seems petty to quibble. The powerful ideas that find expression in *Walden* may seem familiar to us now, but at the time, they were entirely new. Here's one of my favorites:

*Why should we be in such desperate haste to succeed, and in such desperate enterprises? If a man does not keep pace with his companions, perhaps it is because he hears a different drummer. Let him step to the music which he hears, however measured or far away.*

**Lesley:** I like that passage almost as much as the author's entrancing descriptions of the natural world he loved and respected so much:

*A lake is the landscape's most beautiful and expressive feature. It is earth's eye; looking into which the beholder measures the depth of his own nature. The sturdiest trees next the shore are the slender eyelashes which fringe it, and the wooded hills and cliffs around are its overhanging brows.*



**Charles:** Readers will be happy to know that the forests around Walden Pond are healthier and fuller than they were when Thoreau wrote. And that brings me to a final, essential point: as a text that evokes the immeasurable worth of the environment, *Walden* may never be surpassed. And that's just one of the reasons that this unique American text remains relevant and well worth exploring. ■



Thoreau himself was an exemplary reformer, taking great risks in order to help reshape social and political reality. Fresh out of Harvard, he quit his first job as a teacher after being ordered to hit his students. In his early thirties, while working on *Walden*, he was arrested and jailed for refusing to pay his state poll tax, a form of protest against Massachusetts for facilitating slavery. Later, he became involved in the Underground Railroad, hiding fugitive slaves and helping them move on to Canada. And throughout his

life, of course, he wrote eloquent defenses of mistreated people and of the natural environment. In nature, where spirit is always imminent, Thoreau found not only the perfect setting, but also the perfect subject.

### Upcoming Fascinating Classic:

Jane Austen, *Sense and Sensibility*

# EXPLORING CAREER OPTIONS: URBAN PLANNING

## Interview with John R. Gosling

by Ted Winstead

*Thirty years ago the British government changed hands, and a young London architect named John Gosling lost his job building schools. With a degree from London's Architectural Association School of Architecture and marketable skills, he came to the United States, planning a five-year stay. He's been here ever since. Today Mr. Gosling is a vice president and senior planner in the Washington, D.C., office of the architecture and urban design firm RTKL.*

*What do architecture students learn in school?*

As a student, you are exposed incrementally to larger and larger problems. You start off designing a desert island hut and move on to villages, then to urban design clusters, and finally to elements of a city. You learn how to analyze issues and site conditions, evaluate options and technologies, and bring together the different elements in a creative design solution.

*What was your first job in the United States?*

I worked as an analyst for a group called Building Systems Development that was researching ways to make large-scale building programs efficient. At the time, baby boomers were reaching school age, and states like California, Texas, and Illinois had huge shortages of schools. There was no way to build them fast enough conventionally. We were looking at ways to systematize the delivery and design process for the California school system. Then there was a change in government, and those programs were cut.

After some scrambling, I went to work for a developer in Texas who was doing new towns and large-scale community develop-



ment. As an architect, working in a development organization was very interesting. I came away with a good sense of the business side of design issues. That's also when I became more interested in planning.

*What role has your education and early work experience played in your two decades as a planner?*

My training as an architect opened a lot of avenues and enabled me to reinvent myself. I went from being a straight architect to being a systems analyst to being an urban planner, all on the basis of the fundamentals of my original education. Working as an analyst was great preparation for planning; breaking down problems in order to find optimal solutions is the essence of planning.

*What is the history behind the challenges facing urban planners today?*

In the '60s, downtown was the place to be. People worked and shopped downtown, providing cities with strong tax bases. The

issues for planners were largely functional ones, such as how to handle the impact of the automobile on the downtown fabric. There was a lot of talk, for example, about the vertical separation of pedestrians and motorists. You began to see sky bridges as a way to link downtown developments without interrupting the flow of traffic.

By the '80s, the picture was totally different. Decades of so-called "white flight" had taken large numbers of city dwellers to the suburbs. Developers then started building competing centers of employment, such as suburban office parks, near the new housing. Suddenly, people living in the suburbs had a choice—they no longer had to go downtown to work. That change marked the beginning of the hemorrhaging of downtown businesses. Also, downtown retail was in serious trouble by the '80s because shopping had followed housing and employment to the suburbs.

*What has it been like to live through these changes?*

It's sad—really sad. One of the first things Americans notice when they travel abroad is how vibrant, terrific, and mixed foreign cities are. That is because they never had white flight, never had the interstate highway system, and never had programs that encourage development of rural land and farmland around the edges of cities. There has always been a more intelligent reuse of existing buildings and land in European cities than in the U.S.

*In this country, how have urban planners and city leaders responded to changes in downtowns?*

Over the years, planners and public officials have tried almost everything to revitalize downtowns. Many cities established

business retention programs and have used tax incentives to try to lure back retail. In the '80s, cities began investing huge amounts of money in sports venues and festival marketplaces to give suburbanites a reason for coming back downtown.

#### *Where are we today?*

Cities are still investing heavily in sports and cultural amenities, but the focus has come around to housing. Many planners now believe that the missing piece is a resident population that will keep these areas alive. So the question becomes: How do we inject serious amounts of housing into downtown?

One strategy has been to convert certain types of downtown office space into housing. In my opinion, this approach never leads to the creation of a true urban neighborhood because there isn't enough critical mass in a single location. Individual buildings in largely deserted areas may be converted into apartments, but the environment will remain threatening until communities get control of the street space.

#### *What is your firm's strategy?*

RTKL has been focusing on developments at the edge of the downtown core, which is known as the frame. Working with developers, we select areas around sites at the frame, such as abandoned hospitals, industrial sites that are ready for redevelopment, and areas designated for urban renewal in the '60s that were never developed. We then create neighborhoods where people both live and work. Housing is the predominant land use, but retail and office space are sprinkled in. So, for example, we have housing above shops. We've done about 20 of these around the country in cities like Dallas, Nashville, and Denver, and we're very keen on promoting them because we think this is our best hope for revitalizing cities.

#### *What are the first steps after selecting an area?*

We spend a lot of time on community outreach programs. The area may be dysfunctional, but it still has a resident population—usually it's a minority population, or a disadvantaged population, or a population of the working poor. We find that even though residents see that reinvestment may be good for the area, they are fearful of gentrification. Residents worry that they'll get kicked out or that the rents will go up and they won't be able to afford them.

#### *How do you persuade residents to support revitalization efforts?*

We say, "Yes, there will be a change in demographics." But we emphasize that reinvestment will provide residents with opportunities like job training and the means for rehabilitating their homes. Private devel-



In the 1960s, RTKL developed a master plan for Cincinnati that began a process of reuniting the city with its riverfront. Cincinnati 2000, the firm's update plan created by a multi-disciplinary team of planning, transportation, and economic consultants, includes increased residential development within the core.



opers can't provide these kinds of necessary social services, which is one reason that these projects are almost always public-private partnerships. We also explain to residents that this is an opportunity that might not come along again for another 50 years.

#### *Once there's support from the community, how do you begin the revitalization process?*

The first step is to figure out how to connect to the resident population; the intention is not to supersede what already exists and create instant "yuppiehood." Our strategy is the very opposite of urban renewal, where cities were cleared out to create clean slates. It's a street-by-street, building-by-building approach—we might renovate a building

here, half a block there, and leave an entire street untouched. We're very conscious of scale; new structures should not dominate what's already there. We're trying to change the area, but the best parts of the neighborhood's character should be preserved.

#### *What can planners do to help residents turn their community around?*

The goal is to get everybody to reclaim the street space so that residents drive out the criminal element. If you can build up pedestrian movement and activity, the resident population will suddenly own the street space. When this happens, crime drops. As a planner, you try to energize the streets by designing, for example, apartment complexes with retail space, like a laundry or fitness center, that will draw people at the street level. You also try to focus people's attention on the street by using little design features such as multiple front doors and bay windows that look out onto the street.

*Revitalizing downtowns one street at a time is much less profitable than designing sports stadiums like RTKL's Oriole Park at Camden Yards in Baltimore. Why do it?*

RTKL started life as an urban design firm. We have always pursued urban revitalization projects because we believe

that the health of a regional economy depends on the health of its cities. RTKL has never forgotten its roots, and we try to maintain an urban design group in all of our offices.

#### *What do you look for when you hire a new planner?*

We wrestle with this a lot, and it varies from project to project. While we certainly hire graduates of urban design programs, candidates can have a background in landscaping, engineering, planning, architecture—it doesn't matter. What we look for are planners who can leap from a strategic understanding of the issues to purely intuitive creative design solutions. That's a hard thing to do, so in hiring we often take

someone who may not be particularly organized, but who has demonstrated creativity, and we team that person with someone who is organized.

As a planner, you can analyze a problem, identify the public policy issues, grasp a developer's business plan, and understand the economic considerations. Then you can sit down with a map of the area you're planning and arrange all the elements logically with diagrams, and think you're finished. But it's still just a diagram. It hasn't come alive. And that's when the lightning—the inspiration—has to strike. Of course it usually doesn't, but to be really effective in this field, as with anything, you have to have that spark of originality. And you can't learn that in school. You either have it or you don't.

#### *How do you identify talent?*

We can certainly recognize it by looking at a portfolio, but we are interested not so much in the finished product as in the process. What we really want to see are all the little sketches and scraps of paper people throw away before they arrive at their solution. Since no one puts these in a portfolio, we often send people away with an idea and ask them to come back in a week. We learn far more about their thought processes from what is scribbled on scraps of paper than from the slick-looking drawings that everybody puts in their portfolio.

#### *Are planners in some ways like painters and composers who work in isolation?*

Being a planner is the very opposite of being an artist with a capital "a" because you cannot be self-indulgent. Every decision you make has ramifications for a lot of people and for a community. You can't disconnect from everyone else and say, "Well, I'm an artist, and I'll just do my thing—spend my life at my drawing board." The drawing board is the kiss of death. You have to be part of the real world; otherwise you are a lousy planner.

#### *What other skills do planners need?*

Communicating effectively is an integral part of this profession because you have to know how to move your vision forward. Selling an idea is almost like advertising. We spend a lot of time on presentation, using graphic techniques and cartooning to help laypeople understand complicated issues and solutions.

#### *When you go home at night, what brings you back the next day?*

This is the most marvelous career because each day the problems are different. You may be doing the same category of project, but the site is different, the real estate is different, the politics are different—it's a whole new chess match. In the morning you're meeting with public policy makers, and in the afternoon you're on site talking to a builder about changing the size of the windows to bring down the cost of a house. The other marvelous aspect of planning is that the scale changes. One week you're working on neighborhood scale issues, and the next you're designing the front door of a building so that it connects to the street.



#### *Is there always more to learn?*

Always. You have to continue your education throughout your career by reading the right magazines, attending conferences, keeping up with peers and professional groups. You also have to be on top of changes in the business climate and plugged in politically.

#### *Does the world need more planners?*

Yes. Just look at demographics. As countries modernize their economies, they have great needs for new buildings and for housing that will raise standards of living. I'll give you an example. I spent many years in RTKL's Dallas office, and we did a lot of work in Mexico. Each year, about a million 15-, 16-, and 17-year-old Mexicans leave school to enter the work force. Three or four years out of school, these kids form families of their own that need housing. But already there's a huge housing deficiency in Mexico—some 30 million housing units are needed, and the economy obviously

can't support that. It's a problem that's been out there like a time bomb for 50 years. You can say the same thing about Russia, China, and probably India.

We used to read futuristic stories about these kinds of problems in school and think, "That's not going to happen." Well, it has happened. When I was studying architecture, I spent 18 months doing village planning in Nigeria. In 1960, Nigeria's



RTKL participated in the design of Baltimore's Oriole Park at Camden Yards, which takes full advantage of the site's historic surroundings. The restored B&O warehouse, which serves as a dramatic backdrop to the outfield, was converted into office and retail space.

population was 50 million. Thirty years later, the population was 100 million, but the country's infrastructure and its capacity to house its population had not changed much. The need for planners is real, and it's not going away.

#### *What about in the U.S.?*

Obviously the rate of growth here has been much slower. The problem in this country is the rapid and continued suburbanization that threatens small towns and rural land outside metro centers. America still believes that it's a country of unlimited resources, and there really aren't significant regional growth policies in place. Only now is legislation beginning to emerge with any teeth in it that attempts to create a rational approach to growth. It's shocking—absolutely shocking—that in a country as sophisticated as ours, the land-use laws are so lax as to still allow uncontrolled development. You won't find that anywhere else in the world. ■



# PLANNING AHEAD FOR COLLEGE

## Early College Entrance

by Linda E. Brody, Ed.D.

**A**RE YOU CONSIDERING ENTERING COLLEGE FULL-TIME AT A YOUNG age? Although most highly able high school students can find academic challenges by taking advanced courses and seeking supplemental opportunities, others run out of options long before graduation. If you have exhausted most of your high school's offerings, early college entrance may be appropriate for you.

Today, colleges are increasingly willing to accept young students. If you have credentials comparable to those of other top applicants—exceptional test scores and grades, mastery of a strong precollege program of study, and a high level of involvement in extracurricular

activities—your age probably will not be a barrier to acceptance at most colleges.

But some students who are academically ready and eager to go to college early may need more guidance and social support than colleges typically provide. In recognition of these concerns, a number of colleges have established Early Entrance Programs to accommodate the needs of young college students.

Early Entrance Programs admit young students as a special group and provide extra social, emotional, and academic support to help them succeed as full-time college students. They often designate separate housing for the young entrants, which allows them the comfort of living with others their age. Most of the programs offer students a choice of completing their entire undergraduate program at the host college or of transferring to another college or university after completing the early entrance phase of the program.

Admission requirements and the specific natures of these programs vary. For more information, contact directly the programs listed below. ■

## EARLY ENTRANCE PROGRAMS

### Residential

**The Advanced Academy of Georgia, State University of West Georgia, Carrollton, GA 31118; (770) 836-4647**

Students enroll in this one- or two-year program after 10th or 11th grade and earn credit concurrently from their high school and West Georgia University. It is open to non-residents as well as residents of Georgia.

**The Clarkson School, Clarkson University, Potsdam, NY 13699-5650; (315) 268-4425**

Students enter this one-year program after 11th grade and earn credit concurrently from their high school and Clarkson University.

**The Georgia Academy of Mathematics, Engineering and Science, Middle Georgia College, Cochran, GA 31014; (912) 934-3103**

This program, which is intended for mathematics and science majors, consists of two years of course work at a junior college. It is open to non-residents as well as residents of Georgia.

**Program for the Exceptionally Gifted, Mary Baldwin College, Staunton, VA 24401-9983; (540) 887-7039**

This program, for females only, admits students into college one to four years early and prepares them to receive a B.A. after four years in the program.

**Residential Honors Program, University of Southern California, Los Angeles, CA 90089-0153; (213) 740-2961**

Students enter after 11th grade. After one year, students can choose to remain at USC as sophomores or transfer to another institution.

**Simon's Rock College, Great Barrington, MA 01230-1559; (800) 235-7186**

An affiliate of Bard College, Simon's Rock is unique in that the entire college was designed expressly for students of high school age. Most students enter after 10th or 11th grade and pursue either an Associate or Bachelor's degree.

**Texas Academy of Leadership in the Humanities, Lamar University, Beaumont, TX 77710; (409) 880-8046**

Students enroll in this two-year program after 10th grade and earn credit concurrently from their high school and Lamar University. Intended for students majoring in the humanities and limited to residents of Texas.

**Texas Academy of Mathematics and Science, University of North Texas, Denton, TX 76203; (817) 565-3971**

Students enroll after 10th grade. After two years, they are awarded a high school diploma from TAMS in addition to earning credit from the University of North Texas. Intended for math and science majors and limited to residents of Texas.

### New Residential (Fall 1999):

**The Advanced Academy at UMBC, University of Maryland Baltimore County, Baltimore, MD 21250; (410) 455-2680**

Students enroll in this program after 10th or 11th grade. It is open to non-residents as well as residents of Maryland.

**National Academy of Arts, Science and Engineering, University of Iowa, Iowa City, IA 52242; (800) 558-1625**

Students enroll in this program after 11th grade. Those who complete their undergraduate degree at Iowa have priority in graduate and professional school admissions at the university. It is open to non-residents as well as residents of Iowa.

### Commuter

**Boston University Academy, Boston University, Boston, MA 02215; (617) 353-9000**

Students enter the high school in 9th grade and take courses for credit at Boston University in 11th and 12th grade.

**Early Entrance Program, California State University, Los Angeles, CA 90032-8227; (213) 343-2287**

Students between the ages of 11 and 15 enroll in this commuter program. With the guidance of program staff, participants progress from a transition program to full-time college courses as early entrants to matriculation as regular students.

**Early Entrance Program, University of Washington, Seattle, WA 98195-1630; (206) 543-4160**

Students enroll before age 15 and commute for at least the first two years of this program, which includes an intensive one-year preparatory transition school followed by full-time enrollment at the university.

*The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.*

Our reviewers include twelve students, who major(ed) in art history (1), American literature (1), Asian studies (1), biology (3), computer science (1), creative writing (1), English literature (2), French cultural studies (1), history (1), international studies (1), math (1), and political science (2). (The number of majors exceeds twelve because several students have double majors.) Students' comments appear within quotation marks.

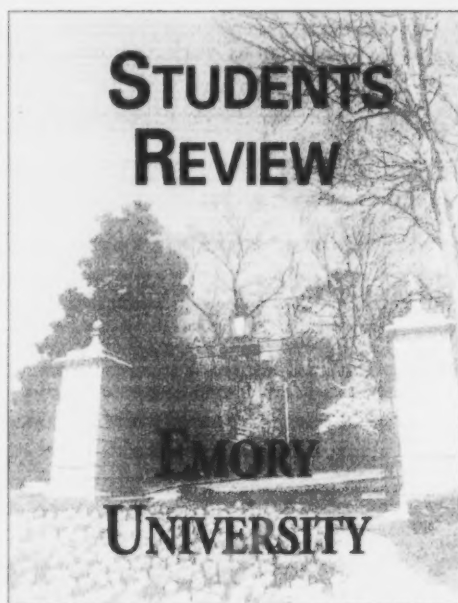
### Quality of Academic Instruction for Undergraduates

Reviewers praised Emory's resources, emphasizing the faculty's commitment and accessibility and the small class size. Several remarked on the extensive technology network on campus and the internship opportunities available in Atlanta.

"Undergraduate educational opportunities abound at Emory. Some of the most popular intro classes (like psychology and art history) have 200 or so students, and most pre-med courses have at least 100. But many departments do not depend on large lecture classes to serve as introductions to a discipline. Most classes are small enough to allow personal attention from instructors, all of whom are eager to help. My largest class at Emory had 30 students, my smallest, 4. I found the professors to be accessible, knowledgeable, and passionate about their fields."

"As a university with 11,000 students, Emory offers a wealth of course options. I enjoyed courses on topics ranging from the local to the global. For a course on Literary Landscapes of Georgia, we visited the homes of Georgian authors; in one on International Non-Governmental Organizations, we heard distinguished guest lecturers, including former President Jimmy Carter."

"Most instructors are very concerned with the quality of the students' experience and lavish attention on passionate learners.



Students have many opportunities to work one-on-one with faculty, yet few of them take advantage of that access. Consequently, those who do tend to get lots of attention. (One exception is in the pre-med track; Emory has many pre-meds, all of whom do seek out faculty advisors.)"

"Emory is a major research institution with top graduate programs in all the sciences, medicine, public health, and law. Academic resources include phenomenal libraries and the latest classroom and residential technology. Strong departments include African American studies, anthropology, English, history, political science, psychology, and all the hard sciences. Math is comparatively weak, and performing and studio arts are severely underfunded and lacking in facilities."

"As a senior, I interned at the Centers for Disease Control (CDC), a national research facility devoted to the study of infectious diseases. The CDC is literally in Emory's backyard, so I was able to walk there from class. I worked with an accomplished epidemiologist on a study of sexually transmitted diseases and preterm birth. It was a great experience, and one that enabled me to gain acceptance to the top graduate programs in the country. Before I came to Emory, I didn't even know what epidemiology was; now I am working toward a Ph.D. in it."

"The Carter Center, a non-partisan public policy institute founded in 1982 by Jimmy Carter and affiliated with Emory, is a unique resource for students interested in human rights, sustainable development, and conflict

prevention and mediation. Interns participate in the Center's work of monitoring events around the world. The Carter Center also sponsors campus lectures and events related to its mission."

"Atlanta, a cultural center and business hub, offers excellent opportunities to students who want experiential education. Internships are available at such world-renowned institutions as the Centers for Disease Control, the Carter Center, the Martin Luther King Jr. Center for Nonviolence, the American Cancer Society national headquarters, CARE International, and Coca-Cola corporate headquarters."

### Social Life

Reviewers cited the Residence Life program and the many benefits of living in Atlanta as definite strengths.

"As wonderful as the classroom learning is at Emory, I often learned even more outside the classroom. Through activities and community service, students have opportunities to truly make a difference, and every student can find social activities that fit him or her. Many students find their sense of community through their involvements."

"A strong Residence Life program facilitates social interaction. The residence halls are well maintained, and every room is wired for cable TV and ethernet. Dorms vary in noise level from airport-runway loud to retirement-home quiet. The Greek system is a popular choice for Emory students—about a third join—and it provides many social activities, but it is definitely not the only way to meet people. Theme houses, which house everything from international students to nature lovers, offer alternatives to dorms and Greek life. Sports, publications, volunteer organizations, student government, and ethnic and racial associations provide other opportunities for interaction."

"Emory is the perfect size. Not too small—I never felt I'd exhausted all the friendships to be made there—and not too big—walking to class, I might wave to a dozen people, and I'm no social butterfly. Atlanta, on the other hand, is big. I attended a UFO conference, went hiking and rafting in the mountains, watched the Hawks and the Braves win more games than they lost, listened to open-mike night at the High Museum, and sampled countless restaurants; and not once did I think that I had done everything there was to do in and around Atlanta."

"There are hundreds of organizations, and if you have an interest that's not represented, the process of chartering a group isn't difficult. Coca-Cola is a generous benefactor of the school, and Emory is overflowing with money."

"Atlanta is, of course, an outstanding draw—great restaurants, terrific music, some amazing museums, beautiful parks, tons of retail shopping, and a rich history and tradition of hospitality. The only drawback for Emory students is getting there. Public transit works but is by no means extensive. Opportunities definitely open up for students who have cars. But even on campus, students can enjoy movies, parties, concerts, dances, theater, and improv."

### What Do You Like Best about Emory?

"The city of Atlanta, with its endless supply of things to do and year-round nice weather. The friendly student body. The helpful faculty. The strong Residence Life program. The generally excellent facilities. The beautiful campus."

"The sense of possibility. The school isn't bogged down by centuries of stuffy tradition; there's a feeling that one can do anything here. And the students are extremely friendly."

"The resources. Emory is awash in funds. I myself helped found both a literary magazine and a \$150,000 student-run television station. Enterprising undergraduates have opportunities hard to match at other universities."

"Emory awards close to 100 merit scholarships. If you are a good student whose financial situation is a factor in your college decision, the Emory scholarship program is one of the best deals in higher education. The Woodruff scholarship covers tuition, room and board, travel, books, and even gives students a \$1000 stipend for summer activities of their choosing. I actually ended up with a small profit after college, a claim not many students can make."

### What Do You Like Least about Emory?

"Emory's strengths cannot be exaggerated. At the same time, it has its shortcomings. The student body is bright but not highly intellectual, and lacks the socioeconomic diversity found at many other schools. Many undergraduates come from very wealthy, privileged backgrounds—the

campus is littered with ostentatious cars—and seem to value superficial things in life."

"Emory is not yet an international university. It probably has fewer international students than any other top U.S. university. Courses about non-European countries—all of which are lumped together in a 'Third World' category, if you can believe it—receive short shrift in the curriculum. Imagine my surprise when I learned that a Japanese history course would fulfill the Third World requirement for my history major! The college has recently revised its core classes to include more variety and global perspective, but it has a way to go, and the Carter Center can't make up for a history of provincialism."

## EMORY UNIVERSITY

Atlanta, Georgia 30322  
800-727-6036

- 4-year private coed university.
- Urban campus near downtown Atlanta.
- Full-time undergraduate enrollment 1998-99: 2,784 men, 3,307 women.
- Special features: To learn more about the Carter Center, see [www.emory.edu/CARTER\\_CENTER/](http://www.emory.edu/CARTER_CENTER/)

"The sad reality is that here in Atlanta, some old attitudes about race, sexual orientation, and gender persist. That's changing, and Emory has taken some bold stances on tough issues. The old traditionalism is giving way, but bumping up against it is a challenge—and also an amazing educational experience. Learning how to confront ignorance and intolerance has been an important part of my personal development."

### Who Would Be Most Compatible with the Academic and Social Atmosphere at Emory?

"Emory students tend to be pre-professional. Much of the incoming student body enters with an interest in medicine, and Emory does have a strong pre-med program. I would stereotype the average student as intelligent and fairly hard-working, but also very interested in having fun."

"There's something here for just about anyone—except perhaps the person who imagines that our Southern location guarantees a strong athletic program. We don't even have a football team! Aside from that, it's a great place."

"Emory is a wonderful, wealthy, beautiful land of opportunity. However, it is not for everyone. It is not the place for the generalist—someone who wants a diverse liberal arts education alongside peers who want the same—or the undecided. As one who entered undecided about my major, I found almost no resources to help me. I didn't receive any advising until I had chosen a major, and by that point, half the battle was over. The weak Career Center had no provisions for counseling someone without preprofessional interests."

### If You Had It to Do Over Again, Would You Go to Emory?

Most reviewers said yes. The three who did not felt that their academic needs or interests would have been better served elsewhere.

"Absolutely. I wouldn't trade my years at Emory for anything—they've been incredibly formative. I'm so sold on the place that I returned here to attend law school."

"Yes. Emory has, by and large, an excellent academic program, friendly students and faculty, and a wide array of extracurricular activities. It has its weaknesses, especially in the arts, but the good far outweighs the bad."

"Actually, no. I had a bent for engineering when I applied to college, but by choosing a school without an engineering program, I limited myself. I have been satisfied with my education at Emory, but I'll never know what I might have learned or become at an engineering school."

**A**s you try to find the school best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.

Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or IAAY.

# THE COACH'S CORNER

by Zuming Feng

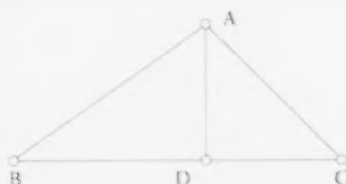
Zuming Feng earned his Ph.D. in mathematics from The Johns Hopkins University. A mathematics teacher at Phelps Exeter Academy, Mr. Feng coaches the school's math team. He participated in the AHSME, AIME, APMA, and the Mandelstam Competition in the summer, and is an instructor in the US Math Olympiad Summer Program. He won the Kelly Award for the national team in the IMO.

## Calculating Area

An important tool in solving geometry problems, area calculation is also an important tool to take with you to the AIME. Several past exams have included geometrical calculation problems involving area. The problems below were designed to strengthen your area calculation skills; solutions will appear in the next issue.

The problems involve the following basic facts:

- In the following diagrams,  $AD \perp BC$  and  $A'D' \perp B'C'$ . If  $BC = B'C'$  and  $AD = A'D'$ , then  $[ABC] : [A'B'C'] = (AD \times BC) : (A'D' \times B'C')$ .



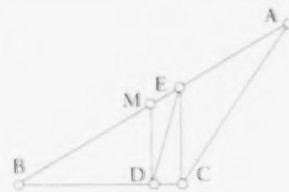
- If two triangles have the same height, their area ratio is equal to that of the corresponding bases.
- If two triangles have the same base, their area ratio is equal to that of the corresponding heights.
- The ratio between the areas of the similar triangles is the square of the ratio between the corresponding sides (similarity ratio).
- If  $ABC$  and  $A'B'C'$  are two triangles with either  $\angle A = \angle A'$  or  $\angle A = 180^\circ - \angle A'$ , then  $[ABC] : [A'B'C'] = AB \cdot AC : A'B' \cdot A'C'$ .

## Exercises

1. In quadrilateral  $ABCD$ , points  $E$  and  $F$  are on  $BC$  and  $CD$ , respectively. Let  $DF = FC$  and  $CE = 2EB$ . If  $[ADF] = m$  and  $[AECF] = n$  with  $n > m$ . What is the area  $[ABCD]$ ?



2. In the obtuse  $\triangle ABC$ ,  $AM = MB$ ,  $MD \perp BC$ ,  $EC \perp MD$ . If  $[ABC] = 24$ , what is the value of  $[BED]$ ?



3. Let  $ABCD$  be a trapezoid with  $AB \parallel CD$ . Let  $AC$  and  $BD$  meet at  $P$ . If  $[ABP] = 18$  and  $[CDP] = 32$ , find the values of  $[BCP]$  and  $[ADP]$ .
4. Let  $ABCD$  be a trapezoid with  $AD \parallel BC$ ,  $AD = 7$ ,  $BC = 17$ . Let points  $E$  and  $F$  be on  $AB$  and  $CD$ , respectively, with  $EF \parallel BC$ . If  $[AEFD] = [EBCF]$ , what is the length of  $EF$ ?

## CORRECTION

Question #6 from last issue's Coach's Corner was printed incorrectly. It should have read: A bag contains only blue and green marbles. If three green marbles are removed from the bag, the probability of drawing a green marble from the remaining marbles would be  $2/5$ . If, instead, seven more blue marbles are added to the bag, the probability of obtaining a blue marble would be  $5/8$ . What was the number of blue marbles in the bag before any changes were made?



# ImaGiNe...

## WORDS

Words fly around the room  
Above my head  
Migrating butterflies  
A thousand colors of whispering wings

On a sturdy chair  
Heavy pencil gripped in my fist  
Knees tucked underneath a neat desk  
I am chained by mediocrity like gravity

Words fly around the room  
Above my head  
Singing a siren's call  
Taunting me like harpies

Alone with the words  
I am a chained prisoner  
Watching them fly away free  
Through the bars of my mind

Words fly around the room  
Above my head  
They will not land on my paper  
Where I long for a poem to alight

Away from my practical desk  
Blank paper, sharpened pencil  
I can forget the words for a while  
I long for freedom

Words fly around the room  
Above my head  
I cannot leave them  
Only they can free me

## UNTITLED

They say you can't hold **Love in your hand**  
But that can't be true  
I know what it feels like:  
Sun on a cold day  
Velvet on iron  
Skin over bone

They say you can't see **Melancholy**  
But that can't be true  
I know what it looks like:  
Sky at twilight  
Mist in the morning  
Inside of eyelids

They say you can't eat **Freedom**  
But that can't be true  
I know what it tastes like:  
Salt of the ocean  
Tang of oranges  
Bittersweet chocolate

## ON A FRIEND'S SUICIDE

You left  
Without saying goodbye.  
That's not what I hate.  
Nobody likes goodbyes.

I thought  
That you were happy.  
That's not what I hate.  
Everybody hurts inside.

You were  
So beautiful and alive.  
That's not what I hate.  
Everybody dies.

You taught me  
A truth about life.  
And that's what I hate.  
I would rather know lies.

*Rebekah Gottlob spent three summers at the University of Virginia Young Writers Workshop, and last summer visited South Africa. Currently a senior at William Monroe High School, she is active in debate and a member of the Academic Team.*



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## DEADLINE COMPETITION

- December 1 & January 1** **JETS-National Engineering Design Challenge and TEAMS Competition—**  
Schools register teams for both competitions, grades 9–12; *Call for state deadlines:* Junior Engineering Technical Society, 1420 King Street, Suite 405, Alexandria, VA 22314-2794; (703) 548-5387, fax (703) 548-0769; jets@nae.edu; www.asee.org/jets
- December 31 & January 15** **American High School Mathematics Exam (AHSME)—**Schools register, grades 9–12; lower fee for earlier date; exam date is February 9: Dr. Walter E. Mientka, American Mathematics Competitions, Department of Mathematics and Statistics, University of Nebraska, P.O. Box 81606, Lincoln, NE 68501-1606; (800) 527-3690, fax (402) 472-6087; walter@amc.unl.edu; www.unl.edu/amc/
- January 10** **National Latin Exam—**Latin teachers register students in Intro Latin–Latin V; Exam given during second week of March: National Latin Exam, P.O. Box 95, Mount Vernon, VA 22121; (800) 459-9847; www.umich.edu/~acleague/
- January 11** **National Greek Exam—**Teachers register students in grades 9–12 (home schoolers may write to explain special circumstances); Exam given during the second week of March: National Greek Exam, Deborah Rae Davies, 123 Argilla Road, Andover, MA 01810-4622; (978) 749-9446; www.umich.edu/~acleague/
- January 15** **National Mythology Exam—**Schools register students in grades 7–9; Exam given in late February or early March: American Classical League, Miami University, Oxford, OH 45056; (513) 529-7741, fax (513) 529-7742; www.umich.edu/~acleague/

## DEADLINE COMPETITION

- January 15** **Duracell/NSTA Scholarship Competition—**  
Individuals or two-person teams enter original devices powered by Duracell batteries; Grades 7–12: National Science Teachers Association, 1840 Wilson Boulevard, Arlington, VA 22201-3000; (888) 255-4242; pbowers@nsta.org; www.nsta.org/programs97/duracell.shtml
- January 18** **"Building the Future" Essay Contest: Urban Planning—**Students, grades 8–12, submit essays on designing cities and towns to improve children's quality of life: Planning Commissioners Journal, (802) 862-9083; pcj@together.net; www.plannersweb.com/essay98.html
- January 27** **National Peace Essay Contest—**Students enter with an adult contest coordinator, grades 9–12: United States Institute of Peace, 1200 17<sup>th</sup> Street, NW, Washington, DC 20036; (202) 429-3854; heather\_kerr@usip.org; www.usip.org/et.html

## Solution to Word Wise

More about...*Aeolian*

35 Down refers to Aeolus, the Greek and Roman god of the wind. An aeolian harp, a simple stringed instrument placed in a window or door, sounds as air currents move through it; it is quite literally played by the wind.





# Knossos Games

by Tim Boester

A first year graduate student in mathematics at the University of Wisconsin  
Tim Boester now has  
collected 11 puzzles and 1  
book size

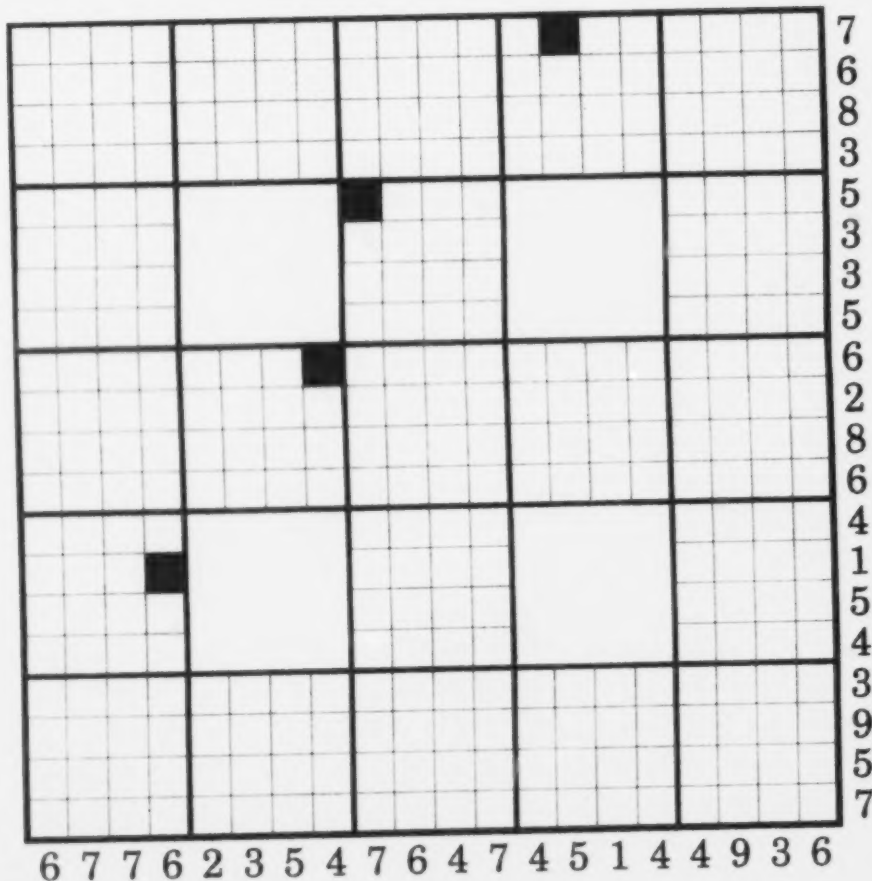
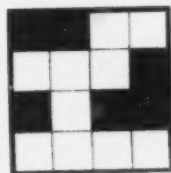
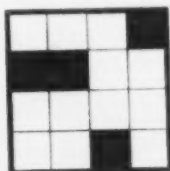


[www.math.wisc.edu/~boester](http://www.math.wisc.edu/~boester)  
[www.math.wisc.edu/~boester](http://www.math.wisc.edu/~boester)

## Directions:

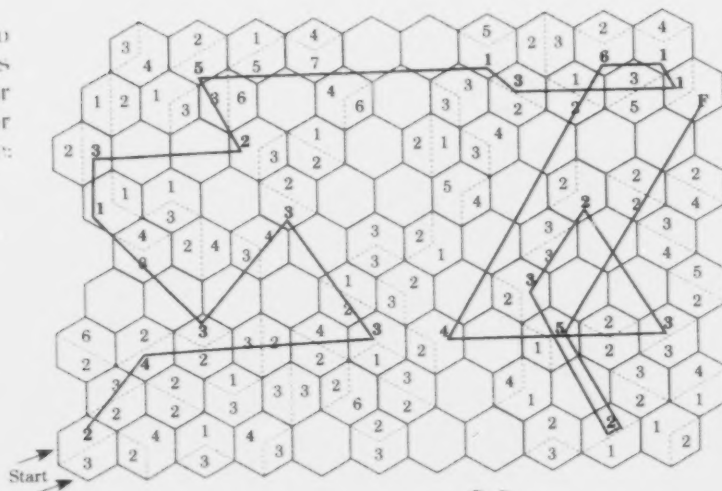
Use the two 4x4 stamps below to fill in the squares of the larger grid. Each stamp may be rotated 90, 180, and 270 degrees. When the grid is correctly filled in, the total number of black squares in a row or column will equal the number found beside or below that row or column.

The squares that are already filled in are hints to get you started; they must be black in the completed puzzle.



Solution to  
Knossos Games  
in our  
September/October  
issue:

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66



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Opportunities and Resources for Academically Talented Youth

1999

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# CONTENTS

## Focus On: Engineering

WHAT EXAMPLES COME TO MIND WHEN YOU THINK OF ENGINEERING? PERHAPS you think of the Eiffel Tower and Hoover Dam, highways and space shuttles, computers and automobiles. But would you also think of toothbrushes, bicycles, and movie theaters? Or pencils, water fountains, and wheelchairs?

Engineering shapes nearly every area of our lives. We wake up to digital alarm clocks, eat foods prepared in microwave ovens, and express our ideas in electronic form. Engineering meets our needs and inspires our dreams. From space flight to virtual reality to aquariums where the meekest of us can look a shark square in the eye, engineers make possible the impossible.

In this issue of *Imagine*, several young engineers describe the projects that have engaged their intellect and creativity. Whether they're building bridges, developing new energy sources, or designing robots, these writers have found ways to combine their mathematical and scientific abilities with a sense of adventure. And by sharing their experiences in engineering competitions and summer programs, five of our writers show that you don't have to be an adult to work on such projects.

Although invention requires knowledge, its foundation is vision and persistence. Have you ever looked at something and thought, "I bet I could improve that"? From a single moment of inspiration, countless possibilities emerge. ■

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### Imagine...

Opportunities and Resources for Academically  
Talented Youth\*

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On the cover:  
A student in IAAY's Investigations in Engineering  
summer program helps to build the spaghetti bridge  
she and her group designed.  
For more information on IAAY summer programs,  
see pages 15 and 16.

# What is Engineering?

by Michael J. Karweit

*With a background in fluid mechanics and sociology, Michael Karweit is a research professor in the Department of Chemical Engineering at The Johns Hopkins University. For the past several years, he has been developing his "What is Engineering?" course to introduce advanced high school and beginning college students to the field.*

**Engineering is a way of thinking.** It's the practice of solving multi-parameter problems using mathematics, science, and technology as tools. And where these tools are inadequate, it's the creation of new tools.

**Engineering is invention.** Engineers develop new devices, materials, or processes to meet the needs that existing technology does not address. Sometimes invention means finding new ways to combine and use existing technologies.

**Engineering is measurement and estimation.** River flow, noise in communication systems, and the failure parameters of automobile tires—to name a few—require measurement. How does one make these measurements? How accurate must they be?

**Engineering is approximation.** When the mathematics and science that relate to a problem are too complex to apply, progress requires approximations, simplifications, and, sometimes, intelligent guesses. But what are appropriate approximations, simplifications, and guesses? That's part of engineering.

**Engineering is modeling and simulation.** To confirm that an idea or design will work, engineers must experiment with a scale model or a computer simulation—perhaps an airplane or a chemical processing column. Then they must determine how to apply the results to full-sized versions.

**Engineering is communication.** Selling designs, collaborating on projects, and writing reports and operation manuals are all a part of engineering.

**Engineering is politics.** The best solution to a problem may be impractical because of political or social objections. Engineers must develop compromises that satisfy functional and social constraints.

**Engineering is finance.** Design, construction, operation, and maintenance all cost money! Realistic cost projections are essential to any engineering project.

**Engineering is art.** The best designs are not only functional but aesthetically pleasing. And creativity is always a must, because unlike in pure science and math, engineering problems never have unique solutions.

**How do you learn engineering?** By doing. By solving problems that involve more than one technical component and have no "text-book" solutions. ■

Check out the "What is Engineering?" Web site at [www.jhu.edu/virtlab](http://www.jhu.edu/virtlab)

## Engineering is Fun!!

In addition to the competitions, summer programs, and organizations you'll read about on the following pages, these Web sites will show you how you can start having fun with engineering.

### Arrick Robotics

[www.arrick.com](http://www.arrick.com)

Whether you need parts for the robot you're building or want to show off the robot you've built, check out this site that bills itself as "your source for robot information on the internet."

### Engineering: Your Future

[www.asee.org/precollege](http://www.asee.org/precollege)

What do engineers actually do? How do you choose an engineering school? How will you pay for it? This site of the American Society for Engineering Education will help you to answer such questions, as well as to find out if you "fit the profile" of an engineer. But beware: You might get distracted by the great math, science, and engineering links.

### RobotBooks.com

[www.robotbooks.com](http://www.robotbooks.com)

Books, magazines, movies—every medium to bring out the roboticist in you! Also check out the kits from LEGO, Robotix and K'NEX, and, of course, the set of links that will take you

from Robot Clubs around the country to (you guessed it!) even more robot links.

### Ronald J. Riley's Kid's Inventor Resources

[www.riley.com/kid-12kidslinks.html](http://www.riley.com/kid-12kidslinks.html)

Links, links, and more links to sites ranging from Build it Yourself to ThinkQuest. Want to make your own Flubber or find out who won the 1998 Student Invention Contest? Start here.

And there are even software packages that allow you to learn engineering concepts by building computer models. Check out Bridge Builder, County Dam, and ModelSmart at [www.pre-engineering.com](http://www.pre-engineering.com) and Model Bridge at [softwareinventions.com/modbrg/index.html](http://softwareinventions.com/modbrg/index.html)

Finally, if you enjoyed the movie *Apollo 13*, you'll want to see *From the Earth to the Moon*, a fascinating 12-hour look at the Apollo space program, made for HBO. Engineering enthusiasts will especially enjoy Part 1: *Apollo 1*, which dramatizes the investigation that followed the explosion of that ship during a routine test, and Part 3: *Spider*, which portrays the seven-year effort by Grumman engineers to design, build, and test the first lunar module. Available for rental in some video stores or for purchase at (800) 618-2266.

# The Art of

*"How?" That simple question has set many curious people on the path of invention. By investigating how things work—whether it's a bridge, a computer chip, or a chemical in a reaction—they've taken the first step toward improving how things work.*

*This collection of articles provides a sampling of the many ways engineers are exploring and improving the world around us. From constructing an aquarium that allows visitors a safe underwater view of marine life, to helping patients recover more quickly from surgery, these six young engineers describe how they're putting ingenuity into practice.*

## Structural Engineering by Adeola Adediran

**H**AVE YOU EVER BEEN TO THE TOP OF THE Empire State Building or the Sears Tower? Did you marvel at the view from the top—or at the building itself? If you marveled at the building, you're probably an engineer at heart.

As a structural engineer, I help turn an architect's vision into reality. The architect provides a picture of what the building should look like and information about the use of space, the location and size of openings in the walls, and other details pertaining to the building's appearance. I then create blueprints that instruct the contractor which materials to use, where to use them, and how much to use. Depending on the structure, the blueprint may become quite complicated, but that is where the fun begins. I work for a firm renowned for designing complicated structures, such as the Houston Ballpark at Union Station, which has a retractable roof; Diagonal Mar, the largest basement structure in the world, in Barcelona, Spain; and the Moody Gardens Aquarium, in Galveston, Texas.

I especially enjoyed designing the Moody Gardens Aquarium, which is similar to Disney's Sea World. The architectural plan called for four enormous cylindrical

concrete tanks, ranging from 50 to 100 feet in diameter and 20 to 30 feet in height. Because we wanted people to be able to see inside, the design called for windows and tunnels in the tanks, making them much more complex structurally than tanks without wall openings. My job was to analyze the structural stresses that the completed tanks would experience and determine a combination of steel and concrete that could safely withstand those stresses.

To visualize the problem, I created a three-dimensional computer model of the tanks and their supports and connections to surrounding structures. These connections were crucial elements of the model because

**Depending on  
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fun begins.**

the tanks would experience structural stresses not only from within—the water pressure on the walls and windows—but also from without. Aquarium visitors walking on the slabs surrounding the tanks would cause movements and vibrations, and those stresses would be transmitted to the tanks.

Using a finite element analysis method, I estimated and modeled the "loads," or the forces exerted by the water, rocks, fish, and people. After seeing exactly how those forces would affect the tanks, I could determine which cement mixes and which strengths and sizes of steel would hold up best under the maximum stresses the tanks would experience. Finally, I drew my design and passed it on for the contractor to build.

As a link between the architect and the builder, I've helped take several designs from drawing board to beautiful and

functional structure. So the next time you're in an underwater tunnel, face to face with a manatee, remember that an engineer made it possible. 

*A structural engineer with Walter P. Moore and Associates in Houston, TX, Adeola*

*Adediran earned her*

*doctorate in structural*

*engineering from the*

*University of Florida. Her*

*identical twin sister is*

*pursuing her doctorate in*

*electrical engineering at Texas A & M*

*University. In her free time, Adeola sings alto*

*in her church choir.*



## Nanotechnology by Michael Yoo

**T**O UNDERSTAND NANOTECHNOLOGY, think small. Really small. Imagine a world a billion times smaller than the real world. Here, everything is measured using the nanometer—*nano* means one billionth, or  $10^{-9}$ —and only ten or so atoms will fit in a nanometer. Nanotechnology scientists all work in this scaled-down world. They might be chemists synthesizing nanocrystals or nanotubes only a few atoms across, biologists building molecular-sized boxes out of DNA, materials scientists forming new composite materials from nanosized powders, or engineers making nanolevers and nanogears and even nanomotors.

As a nanotechnology physicist at IBM, I develop microscopes that can "see" objects in the nanometer-scale world. These microscopes are very different from the optical microscopes found in high school science labs. Instead of eyepieces and lenses, these microscopes have ultrasharp probe tips that serve as specialized sensors. These tips function like the needle in a nanosized phonograph: the test sample serves as the "album," and electronic circuits decode the signals produced by the tip as it scans across the sample.

The first two such microscopes—the scanning tunneling microscope and the atomic force microscope—were invented



# Ingenuity

by Nobel Prize-winning IBM scientists in the 1980s. They can image individual atoms on surfaces by using the tip to detect either the electron cloud or the tiny mechanical forces that surround each atom.

Most of my research has focused on developing new nanoscale microscopes that do more than just locate individual atoms. One of these microscopes, the near field scanning optical microscope (NSOM), uses a tiny pinhole in the end of the tip to shine light onto an area of the sample only a few tens of atoms wide. Since even the most powerful lens cannot focus visible light into an area this small, the NSOM can investigate samples with much higher magnification than any optical microscope. We used the NSOM to study the emission of light from semiconductors, which is the physics behind electronic devices such as LEDs and laser pointers.

I am now working on an electrically sensitive microscope called the single electron transistor scanning electrometer (SETSE). Using a special transistor fabricated on the tip apex, this microscope can measure charges as small as 1% of an electron with nanoscale resolution. We have been able to

**Already used in the automotive, aerospace, clothing, and medical industries, plastic is the material of the future.**

see even individual charged atoms with this microscope. Now we are using the SETSE to study the electrical behavior of the smallest transistors that IBM can make. These transistors must get smaller and smaller every year so that integrated circuits can become faster and more powerful. Soon, these transistors will be nanosized and we will need tools like the SETSE to study and characterize them.

If prevailing wisdom holds, nanotechnology should enjoy a prosperous future in nearly all of the sciences, and I will be in the lab, building yet another tool for the nanoworld. 

*Michael Yoo is a physicist with IBM Research in Yorktown Heights, New York. When not building microscopes, he can be found driving golf balls into the rough on courses throughout the New York metropolitan area.*



## Plastics Engineering by Linda Morawski

*I have one word for you: Plastics.*

**T**HIS FAMOUS LINE FROM THE MOVIE *The Graduate* proved prescient to the future of science and technology. After all, who does not touch or see something made of plastic every day? Already used in the automotive, aerospace, clothing, and medical industries, plastic is the material of the future.

Plastics engineers usually focus on one of three areas: materials, processing, or design. Those working in materials develop new or improved polymers to replace metal or paper—or maybe for something entirely new. For example, new materials might be used in a bullet-proof vest or a medical implant. In processing, engineers determine the best way to convert these materials into an actual product, whether it be football padding, contact lenses, or a child's car seat. Engineers focusing on design, on the other hand, design products—from toothbrushes to catheters for angioplasties—in such a way that they can be manufactured and withstand the stresses of use.

As a plastics designer at Johnson & Johnson, I help develop new consumer products. The process begins with sketches on paper, which we show to a sample of consumers. After learning which designs

they prefer, I use a computer to generate three-dimensional models of the concepts. These models allow me to see how an idea looks and functions in real life; I can determine how much stress a part will encounter during use, how long it will take to fabricate and cool the part, where the plastic resin should enter the part and at what temperature, how much the part will shrink once it cools, and how that will affect the residual stresses in the part. All of these factors are important for the manufacture and use of the final product.

After I have finalized the design, the next step is to use the computer file to generate a model of the part for people to see and touch. One method of prototyping a part is called stereolithography (SLA), in which a liquid epoxy resin is cured with a laser beam

**To understand nanotechnology, think small. Really small. Imagine a world a billion times smaller than the real world.**

in 0.010" layers. If this SLA model meets all aesthetic and functional requirements, that same computer file is sent to a tool-building shop where it is used to create a mold. Tiny resin pellets will be melted down into a liquid polymer and injected into this mold to form the part. It is my responsibility to ensure that this part is the same as the one I drew on the computer and that the mold produces a consistent, quality product.

The uses for plastics today are boundless, and so too are the career paths for those schooled in this discipline. This was one of the main reasons I entered the field. With such high demand for plastics engineers, you can live almost anywhere and work on

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# The Art of

anything from fiber optic cables and laptop computers to baby bottles and children's toys. I'm excited to be working in this field of abundant opportunities, and I look forward to someday working on design projects for medical implants and prostheses. ■

Linda Morawski earned her bachelor's and master's degrees in plastics engineering from the University of Massachusetts-Lowell. She enjoys playing racquetball and is currently working on her MBA.



## Chemical Engineering

by John Kasab

**C**HEMICAL ENGINEERS WORK TO CONVERT raw materials into other products on a scale that is commercially profitable. A "commercially profitable scale" can mean billions of barrels a year. Safely executing chemical reactions on such a grand scale requires not only controlling the chemical reactions themselves, but also moving large quantities of gases or liquids from one place to another within a chemical plant.

My current research ties together fluid dynamics, the study of fluid *motion*, and rheology, the study of fluid *properties*, to address a phenomenon called turbulent drag. As a fluid flows faster, it begins to swirl and form eddies, which quickly leads to turbulent flow. You can see the transition from smooth flow to turbulent flow by slowly opening a water faucet. Even though the water flow becomes more forceful, it is less efficient; much of the additional force is wasted in the turbulence, hence the term "turbulent drag."

To address this problem, we're changing fluids' viscosity, or internal friction, and giving them some elasticity by adding polymers. A high viscosity makes a fluid thicker and hard to pump, so we add only a small amount of polymer. But we have found that even minute quantities of certain polymers

can increase a fluid's elasticity without changing its viscosity much: the fluids I am modeling typically have only 10-100 parts per million of polymer in the solvent. These small amounts of polymer can reduce the amount of energy that is lost in turbulent flow. By spending a little money on polymer additives, we can save a lot of money on energy costs for pumping the fluid.

Because turbulent flow is too complex to model fully, we are studying a simpler problem to gain insight into the more complicated one. In our model, a uniform flow field is perturbed by small fluctuations. Using computer simulations, we can see how changes in flow affect the fluid. In particular, we calculate how stretched out the polymer molecules become as they move along in the fluid. Ultimately, we hope to understand how the polymers reduce turbulent drag, which will let us and other engineers improve our designs for pumps and pipelines.

Although most of my current research involves using computer simulations to find the most efficient way to transport liquids, I must also address considerations beyond saving money. For example, even though drinking water is often pumped

**Without a doubt,  
engineering focuses on  
details, but for every  
problem we must also  
be able to see the  
big picture.**

over long distances, we wouldn't want to add polymers to it because of the potential health risks. In fact, identifying such risks is one of a chemical engineer's most important responsibilities. We must also educate others about these risks. Without a doubt, engineering focuses on details, but for

every problem we must also be able to see the big picture. ■

John Kasab received his Ph.D. in chemical engineering from the University of Wisconsin-Madison, and a B.S.Ch.E. and M.S.Ch.E. from Washington University in St. Louis. He is currently looking for an academic post.



## Satellite Engineering

by Rebecca Torzone

**F**ROM THE TIME I WAS SEVEN YEARS OLD, all I've wanted to do is become an astronaut. This dream was inspired by my second grade teacher and only further encouraged by three trips to Space Camp. At 22 years old, I'm still pursuing my childhood dream.

Currently, I am a systems planning engineer at Lockheed Martin Technical Operations (LMTO), where I work on the Milstar Satellite project. Milstar is a family of six communication satellites, of which two are presently in orbit, that provide the military with secure and instantaneous world-wide coverage. Unlike any other satellites, Milstar satellites have the ability to communicate with each other. Between the six satellites, the military will be able to send messages anywhere in the world at any time.

As a mission analyst on the operations team, my most important and challenging task is the launching of satellites. Launch preparations start years in advance when the design engineers build the satellite. Then it comes to our team for testing.

After completing months of exercises that allow us to identify and work out bugs in our operations concept, we participate in a dress rehearsal. We practice every procedure, from when the satellite is launched to when it is in its proper orbit and functioning on its own. Any unexpected changes, or

# Ingenuity

anomalies, we encounter with the satellite during this simulated mission will prepare us for real-life situations. In fact, anomaly resolution is one of the most critical parts of my job; if I don't respond quickly, the satellites could suffer irreparable damage. For example, if a satellite were to unexpectedly lose power, the heaters would turn off and the equipment would freeze. The antennas would also shut down, preventing us from communicating with the satellite.

Currently IMTO is preparing for the launch of its third satellite, which will take place in early 1999. To test the satellite, we'll conduct an actual launch onboard a Titan IV rocket and turn on all equipment to ensure that it is operating properly. We will also perform system checks to ensure that the telemetry—data such as temperatures, voltages, and power output readings of various equipment—is what we expect. And our work doesn't end with this third satellite: since the software on all Milstar satellites must be compatible, we will essentially have to overhaul the existing software on the other two satellites.

So how will any of this help me to become an astronaut? Since I am learning a tremendous amount about space operations in general, I will have the broad knowledge NASA looks for in an astronaut, and specifically a mission specialist, whose task on the space shuttle is to deploy satellites and conduct experiments. My ultimate goal is either to work aboard a space station or to travel to Mars, both feasible during my lifetime and yours. ☐

*Rebecca Torzone earned a B.S. in engineering physics last May from Embry-Riddle Aeronautical University and is now pursuing an M.S. in computer science. When she's not testing satellites or doing volunteer work, she enjoys flying with her husband, who is a pilot.*



## Biomedical Engineering by Alexander Feng

**B**EEP BEEP. A TONE ALERTS THE nearby nurse, who reads the patient's temperature to be 99.1 degrees. On another floor, through openings the size of a fingernail, an athlete receives a graft to repair a torn meniscus, enabling her to play soccer again within months. Next door, simulations are used to teach medical students the intricacies of a laminoplasty, a procedure to reduce pressure on the spinal cord, improving the chance of a successful surgery without needlessly sacrificing animals.

All of these advances are made possible by biomedical engineering, a burgeoning

**Research in  
biomedical engineering  
has yielded numerous  
results that are put into  
use every day.**

interdisciplinary field that is changing modern medicine. Broadly, biomedical engineering (BME) involves the application of engineering and science to solve problems arising in biology and medicine. BME, then, is the combination of any engineering discipline with any area of medicine or biology; it requires a concrete knowledge of the technical theories of engineering as well as a firm understanding of medicine and biology.

Research in BME has yielded numerous results that are put into use every day. From electrical engineering and computer science come ultrasound, computer tomography (CT), magnetic resonance imaging (MRI), pacemakers, physiological software simulations, and the digital thermometer. In

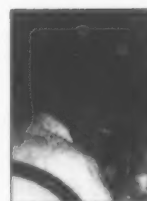
materials science, researchers are developing physical materials for implantation and ensuring their compatibility with living tissue. Their work has led to innovations such as prosthetic limbs and hip implants.

My own work has concentrated on biomechanics and medical instrumentation, both of which apply mechanical engineering to medicine. Biomechanics is the study of the characteristics of biologic materials (solids, fluids, and tissues included) in response to internal and external forces. Research in this area might lead to such concrete applications as the redesign of automobiles to minimize the chance of permanent spinal cord injury in an accident.

Although I spent a good deal of my undergraduate education studying biomechanics, I currently work in medical instrumentation. Our company focuses on the area of urology, seeking to improve therapies for maladies such as prostate cancer. My work focuses on brachytherapy, in which radioactive pellet implants are placed in a cancerous prostate to kill localized malignant cells. Within three months, these pellets decay and become inert. This procedure treats prostate cancer with a low rate of complications and a relatively fast return to a normal lifestyle, allowing, for example, some patients to play golf the day after the pellets are implanted.

My work is especially exciting because it is rapidly advancing brachytherapy and revolutionizing its methods, reducing difficulties of current procedures, and saving lives along the way. ☐

*Alexander Feng is currently working for Indigo Medical, a Johnson & Johnson company. When not working in the corporate world, he enjoys playing ultimate frisbee and cheering*



*for his alma mater, Duke.*

*As a young child, intrigued by the inner workings of a piano, Eser Chamoglu began cultivating a curiosity that would eventually lead him to the world of robotics.*

*In this article, Eser explains how an early interest in taking things apart was translated into his passion for robotics.*

**Igniting  
a Spark,**

**Engaging**

**Time**

**F**OR AS LONG AS I CAN RECALL, I have been fascinated by how things work. When I was three years old, my parents bought an upright piano. I quickly grew bored of creating sounds by pounding on the keys, got my parents to remove the lid, and peered down at the strings, observing how those sounds were produced. As I grew older, I became intensely interested in the mechanical world around me and took apart everything I found interesting, from antiquated record players to expensive cameras.

#### **Getting to Know the Computer (and the Guys at Radio Shack)**

When I was five years old, my mom bought a computer, which she soon abandoned and I soon adopted. I found the computer interesting because I could interact with it. I remember creating rudimentary computer programs in BASIC and being fascinated by the feedback the computer gave me, which was all but absent in the mechanical devices that I had been playing with.

I eventually became interested in electronics and went about assembling numerous electronics kits (and consequently got to know the guys at Radio Shack pretty well). What I didn't know, and what motivated me to learn more about computers and electronics, was how to use the computer to control mechanical devices, such as motors. So in middle school I began to teach myself about the inner workings of the computer and to forage into two other programming languages: C and assembly.

In the seventh and eighth grades, I began using the Internet to conduct my own research into artificial intelligence (AI). Because AI is an extremely broad term that refers to an equally broad field, I decided to narrow my focus to artificial neural networks and their applications in robotics.

#### **Watch out for that Table!**

One day in the 8th grade, I picked up a copy of *Microcomputer Journal* and read about a robotics competition held at Trinity College. The objective of the Fire Fighting Home Robot Contest [Editor's note: see sidebar] is to build an autonomous mobile robot that can navigate through an 8' x 8' single-story model of a house, locate a lit candle, and extinguish the candle in the shortest time possible. Robots can compete at various levels of difficulty. In the most challenging level, inclined ramps are randomly placed throughout the house to thwart any attempts at using dead-

reckoning, the technique of using the rotations of the robot's wheels to deduce its current position.

I decided to design a robot to compete at the highest difficulty level, which requires the robot to navigate around cylindrical objects intended to represent furniture. I wanted my robot to incorporate at least one of the technologies—computational geometry, reactive navigation, artificial neural networks (ANN)—that I had been reading about on the Internet. The use of ANNs would allow my robot to fumble its way through the model house once on competition day, "learning" the plan of the house. Ideally, upon passing through the house a second time, the robot would amaze all spectators by quickly zipping through the house without displaying any of the chaotic behavior evident only moments earlier.

I began designing my robot last year for the 1999 competition and have nearly completed the robot, save one problem: My robot exceeds the height restriction specified in the guidelines, and therefore will need to go through some major surgery.

#### **Anatomy of a Robot**

My robot is composed of three primary systems: mechanical, sensory, and navigation. The mechanical system comprises the motors and its associated accessories (e.g. wheels), the computer-controlled air canister for extinguishing the candle, and the robot body. A laser range finder, collision detection mechanisms, and a pyroelectric sensor for detecting the heat emitted by the candle make up the sensory system. The laser range finder works in conjunction with a rotating mirror mounted on top of the robot. This rotating mirror, which contributes to my robot's excess height, allows the robot to generate a two-dimensional map of its surroundings while remaining stationary.

The third and most critical system of the robot—its central nervous system—is the path-planning system that consists of two onboard computers linked to the motor- and sensor-control hardware. Like the driver of a car, these computers plan a general ("global") path, plan "local" paths, avoid collisions by reactive navigation, and continually revise and update the path based on new information. Each of the three systems must be designed with the others in mind: Going all out on the navigation and sensory systems might make the

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robot too large, as mine is, or make the robot too heavy for its motors to handle.

Integrating these three systems is a "multi-tasking kernel," a program that switches the computer's resources from one activity to another. Operating in real time, this kernel forwards data from the sensory system to the navigational system, which then directs the mechanical system to perform the desired action, such as stopping the robot to avoid a wall. While developing my software I ran into a problem: my software was consuming so much of the computer's resources that the entire system could no longer operate in real time. However, because several of the programs did not directly depend upon each other, I could move them onto a second computer.

Like any engineering project, the design and development of this robot has been a laborious process. Juggling software systems, mechanical systems, and electrical systems, I have had to pay careful attention to each system's specifications and limits. But I see building this robot as the culmination of an enjoyable and rewarding research experience: I have combined the worlds of the mechanical and electrical to build a machine that has satisfied all of my interests. 

*Eser Chamoglu is a tenth grade at Houseman School in New York. An avid reader, Eser also enjoys skiing, hiking and playing golf. Last summer, as an IAAE summer program participant, he visited a robotics lab at Johns Hopkins University. You may send e-mail to Eser at alpha31@ix.netcom.com.*



**The Trinity College (Hartford, CT) Fire Fighting Home Robot Contest** awards cash prizes ranging from \$50 to \$1,000 in each of two divisions: Junior, for high school and younger students, and Senior, for participants older than high school age. The competition is open to teams and individuals.

Jake Mendelsohn, 190 Mohegan Drive, West Hartford, CT 06117.  
JMENDEL141@aol.com, (860) 232-0435  
fax (no phone calls, please).  
[www.trincoll.edu/~robot/rules99.html#co](http://www.trincoll.edu/~robot/rules99.html#co)

## ADDITIONAL COMPETITIONS IN ROBOTICS AND ENGINEERING

### BEST (Boosting Engineering, Science, and Technology) Robot Design Contest

High school and middle school students team up with technologists from local businesses to build a remote controlled robot to accomplish a given task. This regional competition has ten hub sites in Texas, Oklahoma, Arkansas, and Colorado. See BEST's Web site individual hubs; contact information: [www.BEST-NC.org](http://www.BEST-NC.org).

### Botball

Under the guidance of their teachers, high school students work with engineering companies and colleges to build mobile robots within four weeks. Regional tournaments take place in Florida, California, and Washington, DC. KISS Institute, Botball Registration, 10719 Midsummer Drive, Reston, VA 20191; [info@ipr.org/botball](mailto:info@ipr.org/botball).

### Craftsman/NSTA Young Inventors Awards Program

Students in grades 3-5 and 6-8 work independently to design a tool that performs a practical function. Students submit an entry form, an "inventor's log," a diagram of the tool, and a photograph of the student using the tool. Prizes are savings bonds in amounts ranging from \$250 to \$10,000. Craftsman/NSTA Young Inventors Awards Program, National Science Teachers Association, 1840 Wilson Boulevard, Arlington, VA 22201-3000; (888) 294-4994; [www.nsta.org/programs/craftsman.html](http://www.nsta.org/programs/craftsman.html).

### Duracell/NSTA Scholarship Competition

After designing and building a device that runs on Duracell batteries, students submit a description, schematic, and photograph of the device. The top 100 entrants will be asked to send their actual devices for final judging. Prizes are savings bonds in amounts ranging from \$500 to \$20,000. Duracell/NSTA Scholarship Competition, 1840 Wilson Boulevard, Arlington, VA 22201; (888) 255-4242; [www.nsta.org/programs/duracell/default.htm](http://www.nsta.org/programs/duracell/default.htm).

### Engineering Essay Contest

In 1,000 words, high school students identify a specific challenge or problem and explain how engineers can help solve it. Essays are judged on creativity, clarity of expression, and knowledge of math, science, and engineering. One winner from each grade (9, 10, 11, and 12) will receive \$1,000. Professor David Atiyeh, Department of Engineering, Trinity College, 300 Summit Street, Hartford, CT 06106; [www.trincoll.edu/~engineering/essay.html](http://www.trincoll.edu/~engineering/essay.html).

### ExploraVision

Students in four age groups (K-3, 4-6, 7-9, and 10-12) work in teams to research a topic or technology they find in their homes, school, or community. After identifying a problem this topic or technology does not solve, students work together to imagine possible solutions. Each member of the four first-place teams will receive a \$10,000 savings bond; each member of the eight second-place teams will receive a \$5,000 savings bond. Toshiba/NSTA ExploraVision Awards Program, 1840 Wilson Boulevard, Arlington, VA 22201-3000; (800) EXPLOR-9; [www.toshiba.com/ta-exploravision/index3.html](http://www.toshiba.com/ta-exploravision/index3.html).

### FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition

High school students team up with engineers from businesses and universities to design and construct a robot within six weeks. The competition changes each year; past contests have required robots to stack inner tubes on or throw balls into a goal. The competition is conducted as a sporting event, complete with referees and cheerleaders. FIRST, 200 Bedford Street, Manchester, NH 03101; (800) 871-8326; [www.usfirst.org](http://www.usfirst.org).



Left: A group of the 1998 FIRST Robotics Competition students working on their robot.

### The Great Moonbuggy Race

Teams of high school or college students design a human-powered Moonbuggy that will carry two students over a half-mile course that simulates lunar terrain. Prizes are awarded to the top three teams in the college and high school divisions; past prizes have included trips to Space Shuttle launches and Space Camp. Education Programs Office, NASA Marshall Space Flight Center, Mail Code C060, Huntsville, AL 35812; [www1.msfc.nasa.gov/education/moonbuggy/](http://www1.msfc.nasa.gov/education/moonbuggy/).

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# Adventures of a Future Engineer

by *Lizhou Wang*

**W**HEN I FIRST HEARD about TEAMS, I thought it was a manual construction competition and hesitated to participate. But when I learned that TEAMS focuses on design rather than construction, I was ready to sign up. The problems involve extensive mathematical calculations, application of the laws of physics, analytical writing, and creativity. Most importantly, TEAMS allows for creative application of knowledge to real-world problems.

TEAMS problems range from the fantastic, like designing a power station on Mars, to the functional, like designing a car with better fuel economy. And solving even the most apparently simple problems requires finding answers to a set of component problems. Just like real engineers, TEAMS participants must address everything from structural limitations to insufficient funds to questions of safety and quality of life.

Because real engineering projects require a breadth of knowledge, TEAMS problems often cover material not ordinarily studied in the classroom. But I did not know this until I signed up for the 1997 JV team. After the first practice session, I felt lost and bewildered: I was overwhelmed by the demands for physics and chemistry that I had not yet mastered. So I gave my spot on the team to a more deserving person and determined to prepare myself for the next year's competition. In December of my sophomore year, after months of independent study and acceleration in chemistry and physics, I joined the 1998 JV team.

As practice began, our coach divided the team into four groups of two. This would allow us to solve all ten scenarios in the 90 minutes of competition. Each pair worked on problems in their free time and shared solutions at weekly team meetings. At the meetings, we also shared creative approaches and shortcuts, learned to work as a whole team, and developed trust through disagreement and compromise. By debating the problems, we discovered solutions that no one person could have imagined.

February 7, 1998, was our big day. We were a little nervous, but as the problem portion of the exam began, our competitive focus kicked in. My partner and I worked on three problems: improving automotive fuel economy, providing expert testimony about a traffic accident, and designing a water treatment facility. I enjoyed these problems because they addressed issues that regularly impact our lives.

As we worked through all the details, we discovered similarities to problems we had already encountered. For example, recognizing that the traffic accident problem was similar to the inelastic collision problems in physics, we immediately created a free-body diagram of the accident. Using information provided about the timing and final positions of the wreckage, we traced the collision back step-by-step. This allowed us to estimate the initial velocities of the cars prior to collision and, using these speed calculations, to determine which driver should be held responsible for the accident. We then translated our analysis into lay terminology for a hypothetical legal report. This problem showed us how the math, science, and writing that we learn in the classroom are put to use in the daily life of an engineer.

An hour after the exam ended, the winners were announced. All our work had paid off! We were the state champions in our division. But TEAMS gave me much more than a trophy. I made new friends, learned effective teamwork, and mastered scientific principles I wouldn't have encountered until college. TEAMS showed me that by balancing real life and abstract science, engineering will allow me to use math, science, verbal skills, and creativity in a group situation to help better the world.

*A junior at Julian School in Honolulu, Hawaii, Lizhou "Lisa" Wang spends much of her free time working on the school literary magazine, doing community service, and participating in Students Against Drunk Driving. She plans to pursue a career in engineering.*



## The Junior Engineering Technical Society

JETS is dedicated to providing high school students with real-world engineering and problem-solving experience. They offer several opportunities for individual and team participation, including the Tests of Engineering Aptitude, Mathematics, and Science (TEAMS), the National Engineering Design Challenge (NEDC), and the National Engineering Aptitude Search (NEAS+).

The TEAMS competition is a one-day, two-part exam that allows open books, notes, and discussion. Competing teams have 90 minutes to solve ten problems and answer a set of related multiple-choice questions. After a short break, they have 90 minutes to write up reports or design plans based on the problems.

TEAMS competitions include varsity and junior varsity divisions and are held between the second week in February and the third week in March. Schools or home-schooling groups may enter an unlimited number of teams of four to eight 9th–12th graders.

While TEAMS focuses on imaginative problem-solving, the NEDC requires students to design and construct a fully functional device that resolves certain problems or meets special needs. The 1999 challenge requires teams to create a device that can help a person of limited mobility move from a sitting to a standing position. Regional NEDC competitions take place between the end of November and the end of January. Regional first-place winners are eligible to attend the national finals, where they will receive a cash prize and other awards.

A self-administered exam, NEAS+ allows students to assess their math, science, and reasoning abilities and determine areas that need work as they prepare for college majors in the sciences.

For more information, contact the Junior Engineering Technical Society: 1420 King Street, Suite 405, Alexandria, VA 22314-2794; (703) 548-5387; jets@nae.edu; www.asee.org/jets

# Lessons from LEGOs

by Melisa Gao

**A** CONTEST that challenges participants to build elaborate LEGO vehicles? It sounded too good to be true.

I had grown up playing with LEGOs and Lincoln Logs, but they had long since been packed away when I joined my school's Invention Club. I never thought I'd need my LEGOs in middle school, but soon found a reason to pull out my old sets as I prepared for the club's biggest project: the annual countywide E<sup>3</sup> (Engineering, Exploration, Experimentation) Fair—where my years of LEGO expertise would finally be tested in open competition.

## Reinventing Four Wheels

Every year, over a thousand sixth through eighth graders in schools throughout my county participate in this event, sponsored primarily by the Rochester Engineering Society, Eastman Kodak, Xerox, and other locally-based companies. We had two options for participation. Option 1 involved creating a project or invention that would be judged according to grade level. I chose Option 2: building an all-terrain vehicle (ATV) with a contest-specific set of LEGOs provided by the school. In competition, the ATV would have to traverse a 10-meter course consisting of bumps and different surfaces. The object of the contest was to finish the fastest. My partner and I began working on the vehicle after school a few days a week.

April break, about a week before the fair, is known as "crunch time" for E-cubers. We were allowed, for the first time, to work on our LEGO vehicles at home. Our club advisor, a technology teacher, and our mentor, an engineer at Eastman Kodak Company, opened their phone lines, answering frantic questions about how much energy would be lost using a pulley rather than gear-to-gear transfer, or which size wheel would work best on a certain design.

As crunch time began, the E<sup>3</sup> Fair judges added to our stress by making two major changes to the rules. The pack of three C batteries, originally hand-held, now had to be installed in the vehicle. This change added several ounces to the total weight and forced us to alter the structure of the vehicle. The judges also redesigned the surface of the



track. Instead of the surface of marbles and wooden ridges we'd practiced on, we now had to contend with shag carpet and wooden speed bumps. Though this was frustrating, it taught me about the real world: nothing is final and if something goes wrong, the only thing to do is to deal with it.

So we headed back to the drawing board. We managed to pull a remodeled vehicle together and, on competition day, placed 12th out of 125 teams. After the many hours we'd spent mulling over which gear transfer or torque-to-speed ratio would work best, we enjoyed seeing the different designs produced by the top teams. We were especially impressed by the top two vehicles, whose designers had suspended their battery packs differently than the rest of us, placing a minimum of pressure on the motor.

## Balancing Act

The following year, the judges changed Option 2 to a stationary lift vehicle. Eighth

grade was my last year of eligibility for E<sup>3</sup>, so I'd been hoping to perfect my ATV design. But I accepted my fate and, with a new partner, tackled this unexpected challenge. We had to build a LEGO crane able to lift as much weight as possible. Because our crane lifted the weight to one side, our biggest difficulty was keeping it from tipping over. With our limited LEGO kit, we had few parts to use as counterbalances. After many failed attempts, we came up with a design that used "legs," which dangled from about halfway up the lifting arm. The legs reached the ground before the tipping crane and prevented it from falling over. This nearly doubled the amount of weight it could lift!

At the fair, our vehicle came in 13th. We had hoped to place higher, but were gratified when a team from a nearby school complimented our design. I, in turn, admired the winning team's design. They had built a vehicle with four legs that lifted the weight through the middle. This ingenious alternative to a crane design made it impossible for the vehicle to tip over. And that was what E<sup>3</sup> was all about: being creative and learning from each other.

As an E<sup>3</sup> participant, I expanded my knowledge of science and learned the value of teamwork. Now, as a freshman in high school, I am involved in several similar clubs. For the Science Olympiad, I am working to design a car that will traverse a given distance and stop in front of a barrier. I am also contemplating a career in engineering. After all, what could be better than the E<sup>3</sup> Fair every day? ■

*A freshman at Brighton High School in Rochester, NY, Melisa Gao was captain of her school's MATHCOUNTS Team last year, which placed first in New York State, and she also participates in many other math competitions. In her spare time*

*she plays tennis, basketball, and volleyball.*



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# Capturing the Sun's Energy

by Carey Tanner

**T**HE VAST MAJORITY OF THE ENERGY consumed around the world is generated from oil and coal, the two main fossil fuels. However, as these non-renewable resources diminish, and as the environmental problems they cause increase, the race is on to create alternative means of energy production that are efficient, cost-effective, and environmentally sound. This goal inspired me to take on a four-year research project that culminated, in my senior year of high school, with the creation of a novel solar-powered cell.

## From Musing to Measuring

My fascination with solar power began simply enough. When I was young, my family owned a sailboat that used several solar panels to generate energy that powered an onboard fridge. As we sailed, heeling and swaying in the wind, the angle at which the sun's rays hit the solar panel constantly changed. I wondered how much of a difference that angle of incidence made in the solar panel's energy output. With those idle musings, my journey began.

In what became my eighth-grade science fair project, I took a solar panel onto dry

land and hooked it up to a small motor. By programming the motor to move the panel every ten minutes, I could maintain the panel at a near-optimal perpendicular angle to the sun. Using a voltage meter to record the current generated by the cell, I found that tracking the sun greatly enhanced the cell's output. These simple experiments whetted my curiosity about solar energy collectors. How do they work? And why aren't they used more often?

A conventional solar-powered cell relies on a phenomenon called the *photoelectric effect*. Certain materials absorb light energy and convert it into electrical energy, thus *transducing* energy from light into electricity. To be photoelectric, a material must be both a light energy absorber and an electrical conductor—it must be able to capture light energy *and* pass that energy along. When a photoelectric material is part of an electrical circuit, light energy can drive the circuit and produce electricity. Most solar cells today use various forms of silicon, a semiconductor that absorbs light in the ultraviolet (UV) range.

Since solar-powered cells can generate energy only while the sun shines upon them, they have some obvious limitations.

However, the main reason they are not used for mass energy production is their high cost relative to fossil fuels. The process of making the cell's crucial component—a thin layer of crystalline silicon dioxide ( $\text{SiO}_2$ )—is costly. Solar cell manufacturers have developed less expensive procedures (using non-crystalline  $\text{SiO}_2$ , for example), but those modifications reduce the cells' efficiency as well as cost, making them no more cost effective than the crystalline  $\text{SiO}_2$  cells.

Solar cells could be made more cost effective by lowering their manufacturing cost or by increasing their energy output. I chose to focus on the latter approach, to find a way to gather more energy from the light. Since  $\text{SiO}_2$  absorbs light energy only in the UV region, a  $\text{SiO}_2$ -based solar cell can capture only a fraction of the energy in sunlight. When I was in ninth grade, I conceived of a cell capable of capturing energy from a broader spectrum of light, taking my lead from nature's broad-spectrum light energy collectors: plants.

## Learning from Nature

Plants capture light energy in the visible range using pigments such as chlorophyll.



These molecules are *photochemical transducers*; they undergo a reversible chemical reaction when they absorb light.

However, simply absorbing light energy does not harness that energy; to be useable, it has to be portable so it can be carried to where it's needed. Plants accomplish this using a relay of energy donor and acceptor molecules known as oxidation-reduction, or redox, agents. Light-activated chlorophyll transfers energy to a redox acceptor; once the redox acceptor is energized, it becomes a donor and passes the energy on to another acceptor. Like a hot potato, energy is passed from one redox molecule to another, away from the chlorophyll, which is then free to absorb more light energy and start the chain of events all over again.

biological system, redox acceptors are well-positioned to receive energy from chlorophyll; millennia of evolution have seen to that. My methods of controlling the relative positions of pigments and redox acceptors would, by comparison, be quite crude.

## A Photoelectrochemical Cell

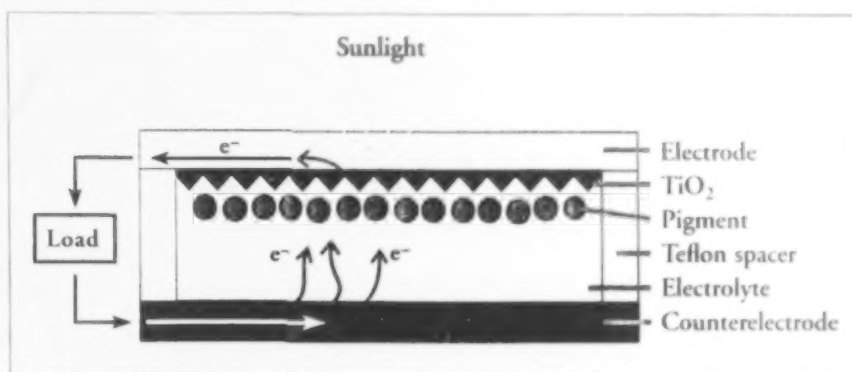
Before I could begin the experiments I wanted to do—testing a pigment-enhanced cell—I had to start at square one, constructing a basic, “unenanced” solar cell. Its energy absorption characteristics would be the baseline value for all of my subsequent measurements. Because  $\text{SiO}_2$  is so expensive, I used a similar compound, titanium dioxide ( $\text{TiO}_2$ ) instead. Much less expensive than  $\text{SiO}_2$ ,  $\text{TiO}_2$  is also a less

found that the activated pigment molecules transferred energy to the  $\text{TiO}_2$  if I chemically “roughed up” the  $\text{TiO}_2$  surface, increasing its surface area.

Ultimately, I achieved what I had set out to do. The  $\text{TiO}_2$  cell's power output increased by an impressive 250% when it included a red-sensitive pigment, and 220% with a blue-sensitive pigment. When both pigments were used in a single cell, the overall power production increased by 460%. Remarkably, this broad-spectrum, solar-powered  $\text{TiO}_2$  cell attained an efficiency commensurate with that of state-of-the-art  $\text{SiO}_2$  cells—at one-tenth the cost.

## Reflections

When I began this work, I never imagined the places it would take me or the remarkable people I would meet. In tenth grade, I won a trip to the International Science and Engineering Fair, held that year in Tucson, Arizona. There I received second place overall in the Chemistry division and a first place award from the U.S. Department of Energy for the best project related to energy research, and another first place award from NASA. That prize included an all-expenses-paid trip to NASA's Ames Research Center, where I had the privilege of presenting my research to a group of NASA scientists. In the twelfth grade, I was chosen as a finalist in the 57th Annual Westinghouse (now Intel) Science Talent Search, an honor that included an all-expenses-paid trip to Washington, D.C., and the opportunity to meet brilliant scientists young and old. All these opportunities came from following my curiosity, which opened up a world of possibilities that I would never otherwise have found.



**Schematic of the photoelectrochemical solar cell.** Like a waterwheel which generates power only when driven by flowing water, an electrical circuit generates power only when driven by flowing  $\gamma$ -rays. In this cell a conducting glass support is covered with a thin film of  $\text{TiO}_2$  and a layer of photosensitive pigment. Light absorbed by either the  $\text{TiO}_2$  or pigment excites electrons, giving them the energy to drive the circuit. Energy is thus transduced from light to electricity. The circuit is completed by electrons returning through the counter-electrode and the electrolyte (solution) in the inter-electrode space. Teflon spacers between the electrode and counter-electrode prevent a short circuit.

In contrast to the burning of fossil fuels, which generates energy only by consuming molecules, photosynthesis generates energy without consuming any of the molecules in the redox relay. They all simply cycle back and forth between higher and lower energy states. In more technical language, we can say that light initiates a series of *regenerative photoelectrochemical reactions*. I wanted to do something similar in a solar cell.

My plan was to use pigments similar to chlorophyll to capture light energy. I knew pigments could *absorb* light energy, but would they *transfer* that energy to a redox acceptor? Only if the pigment molecules passed their energy on to a redox acceptor would light energy be harnessed. In a

efficient UV-energy transducer. However, if I could increase the cell's energy capture using pigments, that might compensate for  $\text{TiO}_2$ 's inefficiency—and still keep the cost below that of a  $\text{SiO}_2$  cell.

The solar energy collector was simple in concept: a glass electrode with thin layers of both  $\text{TiO}_2$  and pigment. The  $\text{TiO}_2$  layer would function as a UV-energy transducer, a redox acceptor for the light-activated pigment, and a semiconductor to carry captured energy to the glass electrode. While the concept might be simple, creating a functional cell was not. I spent months tinkering with the manufacturing process, experimenting with the procedure by which I made the ultra fine layers. Eventually, I

A native of Fort Myers, Florida, Carey Tanner is now a freshman at MIT where she plans to major in chemical engineering. For more about her solar cell, see [www.mit.edu/~ctanner/whisper.html](http://www.mit.edu/~ctanner/whisper.html)



# ENGINEERING: More Than Math and Science

by Kelly Davis

**B**EFORE I TOOK the CTY Investigations in Engineering course, I had no idea what engineers do, where engineers work, or even what courses an aspiring engineer takes in college. My school doesn't offer any engineering classes or clubs, so I had never had any opportunities to learn about the field. When asked what I was planning to study in college, I always responded vaguely: "Oh, maybe math or computer science." I had never considered engineering, but that was about to change.



*Engineering is all about collaboration.*

## Exploding the Myths

Before the course began, we were required to read *Engineering and the Mind's Eye* by Eugene S. Ferguson. He argued that in engineering, creativity and intuition are as important as math and science. This surprised and intrigued me.

Throughout the course, I discovered another surprising aspect of engineering: how collaborative it is. I had always thought of engineering as a solo venture, but on the first day of class, we watched a video of a group of engineers in a large planning room. Sketching on large pads of paper, creating intricate designs on chalkboards, and working at tables with rulers and compasses, they continually discussed

and shared ideas. This was very different from the engineer I had envisioned: a solitary figure cooped up in a tiny office with only a drawing board and a coffee pot to keep him company.

Like real engineers, we worked in groups for just about every project. At first, I was wary of group work. I had always disliked it in school because only a few of us were ever actually interested in the work; we always ended up doing the entire project while the rest of the group sat back and did nothing. So I was worried when our engineering instructor began dividing us into groups of three. But as we tackled the assigned projects, I discovered that working in a group can be more effective (and more fun!) than working alone.

## String, Spaghetti, and a Mousetrap

Once we had a general idea of what engineers do, we began learning the fundamental principles engineers use to solve problems. Each of our projects focused on one or two main ideas.

Perhaps the most basic principle in engineering is precision. Even tiny errors can result in huge consequences. This is particularly true of initial measurements. For one project, we had to find the distance between the cupolas of two buildings on campus using only a 20-foot string, a ruler, and duct tape. My group started by locating a focal point on the ground somewhere between the two

buildings. From that point, we measured the distance to each building and then visually positioned the ruler in such a way as to measure the angle from the ground to the tip of the cupola. We used our measurements and trigonometry to calculate the distance between the buildings' cupolas. Even though our measurements were only a few inches and a couple degrees off, our final calculation was over 200 feet off!

After learning the significance of accuracy in calculations, we started another project that stressed the importance of careful and thorough planning. We began by designing a miniature one-lane bridge, to be made out of spaghetti and epoxy. The object was to build a bridge that could support the most weight. We spent at least three hours determining the angles, structure, and most effective supports for our bridge. Once construction began, we frequently adjusted our plans to accommodate our materials, which, just like building materials in the real world, aren't perfect. We also continually incorporated new ideas for improving our bridge. So we learned that planning is not only the first step of any project, but also an ongoing process that doesn't end until construction is complete.

But a good design or even a completed model is not the end of a project. Engineers must be able to communicate their thoughts



*One of many bridge designs.*

and designs clearly and accurately to others. We learned this concept by designing and explaining how to build a mousetrap. Given only a piece of stiff paper, a rubber band, and glue, we had to build a mousetrap that would catch a "mouse" (a Ping-Pong ball) and keep it from rolling out, even if the trap were turned upside down and shaken. After completing our design, we had to write full instructions for re-creating it—not as simple as it sounds. We had to include dimensions, step-by-step directions, and drawings. Our grade depended on how well another group could build our mousetrap using our instructions. If we made one mistake, or even if our directions were interpreted the wrong way, the whole contraption would be constructed wrong and it wouldn't work!

Ultimately, I learned that Ferguson was right. Engineering does require creativity and ingenuity. In each of our projects, we had to brainstorm ideas before we could start. Engineering is basically problem solving, but there is never only one solution to a problem. Whether building bridges or just sharing a design with others, engineers must anticipate future needs and exploit their artistic instincts as they envision better, more elegant, and more efficient solutions. 

*Kelly Davis is a sophomore at Selinsgrove Area High School in Selinsgrove, PA. She writes for the school newspaper, plays on the varsity tennis team, and tutors in math.*



**Investigations in Engineering** is a three-week course offered by Johns Hopkins University's Center for Talented Youth. Developed by a faculty member of the Whiting School of Engineering at Johns Hopkins, this course can be taken as a credit or non-credit course.

For more information: IAAY Summer Programs, The Johns Hopkins University, Baltimore, MD 21218; (410) 516-0277 or (818) 500-9034; [www.jhu.edu/~gifted/programs.html](http://www.jhu.edu/~gifted/programs.html)

Students must earn qualifying SAT scores to participate in CTY summer programs.

## ADDITIONAL SUMMER PROGRAMS IN ENGINEERING

The following programs seek to introduce precollege students to engineering course work and careers. Admission to many of these programs is competitive, requiring qualifying SAT scores, GPA, or class ranking; be sure to inquire about specific admissions criteria. Grades specified refer to students' Spring 1999 grade level.

### Engineering 2004

Grade 11, one week, residential. Dean's Office, School of Engineering, 102 Pangborn Hall, Catholic University of America, Washington, DC 20064; (202) 319-5160

### Frontiers in Science, Mathematics, and Engineering

Grade 11, two weeks, residential. Strive, Worcester Polytechnic Institute, 100 Institute Road, Worcester, MA 01609; (508) 831-5592; [www.wpi.edu/Academics/Special/Outreach/Frontiers/](http://www.wpi.edu/Academics/Special/Outreach/Frontiers/)

### Minority Introduction to Engineering

Several colleges offer this one-week program for minority students in 11th grade.

Auburn University: Dr. David Cico, MITE Program Director, 211 Aerospace Engineering Building, Auburn University, Auburn, AL 36849; (334) 844-6820

Purdue University: Minority Engineering Program, Purdue University, 1286 ENAD #214A, West Lafayette, IN 47907; (317) 494-3974; [fairway.ecn.purdue.edu/~mep/mite.html](http://fairway.ecn.purdue.edu/~mep/mite.html)

University of Virginia: Office of Minority Programs, MITE Program, Thornton Hall D 111, University of Virginia, Charlottesville, VA 22903; (804) 924-0604; [www.seas.virginia.edu/minority/mite.html](http://www.seas.virginia.edu/minority/mite.html)

### Minority Introduction to Engineering, Entrepreneurship, and Science

Grade 11, six weeks, residential. MITE'S Program, Massachusetts Institute of Technology, Room 1-211, 77 Massachusetts Avenue, Cambridge, MA 02139; (617) 253-3298; [web.mit.edu/mites/www/](http://web.mit.edu/mites/www/)

### Minority Introduction to Technology and Engineering

Minority students in grades 9 and 10, four weeks, residential. Minority Engineering Program Office, University of Michigan, 1221 Beal Avenue, Ann Arbor, MI 48109; (734) 764-7120

### Operation Catapult

Grade 11, two three-week sessions, residential. Thomas D. Miller, Rose-Hulman Institute of Technology, 5500 Wabash Avenue, Box 7, Terre Haute, IN 47803; (800) 552-0725 (Indiana); (800) 248-7448 (out of state); [www.rose-hulman.edu/catapult/](http://www.rose-hulman.edu/catapult/)

### Science and Engineering Internship Program

Grade 11, six weeks, residential. Internship Program Coordinator, Physics Department, Boston University, 590 Commonwealth Avenue, Boston, MA 02215; (617) 353-2600; [physics.bu.edu/highschool.html](http://physics.bu.edu/highschool.html)

### Student Introduction to Engineering

Grades 10 and 11, two one-week sessions, residential. Kay Leager, North Carolina State University, College of Engineering, P.O. Box 7904, 118 Page Hall, Raleigh, NC 27695; (919) 515-3264; [www.engr.ncsu.edu/academic/SITE/index.html](http://www.engr.ncsu.edu/academic/SITE/index.html)

### Summer College Engineering Exposure

Minority students in grade 11, two weeks, residential. Minority Engineering Program Office, University of Michigan, 1221 Beal Avenue, Ann Arbor, MI 48109; (734) 764-7120

### Summer Engineering Exploration

Girls in grades 10 and 11, one week, residential. Society of Women Engineers, University of Michigan, Ann Arbor, MI 48109; (734) 763-5027

### Summer Institute for Creative Engineering and Inventiveness

Grades 8-11, three weeks, residential. Jan Warren, University of Iowa, 210 Lindquist Center, Iowa City, IA 52242; (800) 336-6463; [newton.uiowa.edu/~belinctr/precollege/brochure/sice.html](http://newton.uiowa.edu/~belinctr/precollege/brochure/sice.html)

### Summer Opportunities and Research for Space

Grades 10 and 11, two weeks, residential. Richard Devon, Penn State National Space Grant College and Fellowship Program, 101 South Frear, Penn State University, University Park, PA 16802; (814) 863-7688; [www.psu.edu/spacegrant/Soars.htm](http://www.psu.edu/spacegrant/Soars.htm)

### Summer Study in Engineering for Women

Girls in grades 10 and 11, two one-week sessions, residential. Women in Engineering, A. James Clark School of Engineering, University of Maryland, College Park, MD 20742; (301) 405-3597; [www.engr.umd.edu/wie/](http://www.engr.umd.edu/wie/)

# SELECTED ACADEMIC SUMMER PROGRAMS 1999

Many opportunities exist for you to continue challenging yourself academically during the summer. We have received positive reports from participants about the programs listed below.

Space in many summer programs is limited, so we suggest you apply early. You'll want to inquire about qualification requirements, course options, dates, fees, and scholarship availability. Grades specified refer to students' Spring 1999 grade level.

## IAAY ACADEMIC SUMMER PROGRAMS

### Center for Academic Advancement

Grades 7-10, 3 weeks, residential sites in CA, MD, and PA.

### Center for Talented Youth

Grades 7-10, 3 weeks, residential and commuter sites in CA, MD, NY, and PA.

### CTY Young Students

Grades 2-6, 3 weeks, commuter sites in MD and VA. Grades 5 & 6, 3 weeks, residential sites in CA, MA, MD, and PA.

*IAAY Summer Programs, The Johns Hopkins University, Baltimore, MD 21218; (410) 516-0277 or (818) 500-9034; [www.jhu.edu/~gifted/programs.html](http://www.jhu.edu/~gifted/programs.html)*

### SDB Learning Center

Grades 4-6, 4 weeks, commuter site in CA.

*SDB Learning Center, IAAY, The Johns Hopkins University, 206 N. Jackson Street, Suite 304, Glendale, CA 91206; (818) 500-9034; [www.jhu.edu/~gifted/wcrol/index.html#Center](http://www.jhu.edu/~gifted/wcrol/index.html#Center)*



## OTHER REGIONAL TALENT SEARCH PROGRAMS

### Center for Talent Development

Grades 4-12, 3 weeks, residential and commuter. *CTD, Northwestern University, 617 Dartmouth Place, Evanston, IL 60208; (847) 491-3782, fax (847) 467-4283; [ctdnet.acns.nwu.edu/](http://ctdnet.acns.nwu.edu/)*

### Duke University Talent Identification Program

(See also Science and Study Abroad.) Grades 7-10, 3 weeks, residential. *Duke University TIP, Box 90747, Durham, NC 27708-0747; (919) 684-3847; [www.tip.duke.edu](http://www.tip.duke.edu)*

### Rocky Mountain Summer Institute

Ages 10-15, 2 weeks, commuter. Ages 12-16, 3 weeks, residential and commuter. *Rocky Mountain Talent Search, University of Denver, Wesley Hall-Room 203, 2135 East Wesley Avenue, Denver, CO 80208; (303) 871-2983; [www.du.edu/education/ces/si.html](http://www.du.edu/education/ces/si.html)*

## OTHER TALENT SEARCH PROGRAMS

### ADVANCE Program for Young Scholars

Grades 7-11, 3 weeks, residential. *Programs for the Gifted and Talented, Northwestern State University, P.O. Box 5671, Natchitoches, LA 71497; (800) 259-3173 (within state); (318) 357-3174 ext. 148*

### Academic Talent Search and Accelerated College Entrance Center

Grades 6-9, 1-5 weeks, commuter. *ATS, California State University-Sacramento, 6000 J Street, Sacramento, CA 95819-6098; (916) 278-7032; [edweb.csus.edu/projects/ats](http://edweb.csus.edu/projects/ats)*



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#### **Belin-Blank Center**

Grades 6-8, Junior Scholars Academy; grades 9-11, National Scholars Academy, and Summer Institute for Creative Engineering and Inventiveness. 1-2 weeks, residential. *Belin-Blank International Center for Gifted Education and Talent Development, The University of Iowa, 210 Lindquist Center, Iowa City, IA 52242; (319) 335-6148 or (800) 336-6463; [www.uiowa.edu/~belinctr](http://www.uiowa.edu/~belinctr)*

#### **Center for Academic Precocity**

Grades preK-12, 5 weeks, commuter. 6-12, 5 weeks, residential. *CAP, Arizona State University, Box 872711, Tempe, AZ 85287-2711; (602) 965-4757; [www-cap.ed.asu.edu](http://www-cap.ed.asu.edu)*

#### **Center for Gifted Studies**

Grades 7-10, 3 weeks, residential. *The Center for Gifted Studies, The University of Southern Mississippi, Box 8207, Hattiesburg, MS 39406-8207; (601) 266-5236; [www-dept.usm.edu/~gifted/](http://www-dept.usm.edu/~gifted/)*

#### **Office of Precollegiate Programs for Talented and Gifted**

Grades 6-9, Explorations, 1 week. Grades 7-11, CY-TAG, 3 weeks. Residential and commuter. *OPPTAG, W172 Lagomarcino Hall, Iowa State University, Ames, IA 50011-3180; (515) 294-1772; [www.public.iastate.edu/~opptag\\_info](http://www.public.iastate.edu/~opptag_info)*

#### **Purdue University Gifted Education Resource Institute**

Grades 7-8: Star; grades 9-12: Pulsar; 3 weeks. *Summer Residential Programs, Purdue University GERI, 1446 LAEB, Room 5114, West Lafayette, IN 47907-1446; (765) 494-7243; [www.soe.purdue.edu/geri](http://www.soe.purdue.edu/geri)*

#### **Southern Methodist University Gifted Institute and Precollege Programs\***

Grades 7-9, 3 weeks. Grades 10-11, 5 weeks. Residential and commuter. *SMU/TAG, P.O. Box 750383, Dallas, TX 75275-0383; (214) 768-5437; [www.smu.edu/~gsi/](http://www.smu.edu/~gsi/)*

#### **Summer Program for Verbally and Mathematically Precocious Youth\***

Grades 7-10, 3 weeks, residential. *VAMPY, The Center for Gifted Studies, Western Kentucky University, One Big Red Way, Bowling Green, KY 42101-3576; (502) 745-6323*

#### **Summer Stretch\***

Grades 7-9, 5 weeks, commuter. *Halbert Robinson Center for the Study of Capable Youth, University of Washington, Box 351630, Seattle, WA 98195-1630; (206) 543-4160; [weber.u.washington.edu/~csc/](http://weber.u.washington.edu/~csc/)*

#### **Wisconsin Center for Academically Talented Youth**

Grades 5-6, 1 week, residential. Grades 7-10, 3 weeks, residential. Grades 11-12, 3 weeks, residential. *WCATY, 2909 Landmark Place, Madison, WI 53713; (608) 271-1617; [www.tds.net/wcaty/](http://www.tds.net/wcaty/)*

\* First come, first served.

## **LANGUAGES**

#### **Concordia Language Villages**

Ages 7-18, 1-4 weeks, residential. *Concordia Language Villages, 901 South Eighth Street, Moorhead, MN 56562; (218) 299-4544, (800) 247-1044 (within state) or (800) 222-4750 (out of state); [www.cord.edu/dept/ele](http://www.cord.edu/dept/ele)*

#### **Foreign Language Institute, and Young Writers Workshop**

Grades 9-12, college credit, residential. *Foreign Language Institute, Simon's Rock College of Bard, 84 Alford Road, Great Barrington, MA 01230-9702; (413) 528-7698 and (413) 528-7231; [www.simons-rock.edu/academics/summer/summer.html](http://www.simons-rock.edu/academics/summer/summer.html)*



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# SELECTED ACADEMIC SUMMER PROGRAMS 1999

## PERFORMING ARTS

For a listing of Performing Arts programs, see the November/December 1998 issue of *Imagine* and *The Best Performing Arts Programs* (Random House, 1998, \$24.95).

## MATHEMATICS

### Canada/USA Mathcamp

Ages 13-18, 5 weeks, residential. Rolling admissions. *Mathcamp*, 3560 Pine Grove Avenue, Port Huron, MI 48060; (519) 672-7990; [www.mathcamp.org](http://www.mathcamp.org)

### Hampshire College Summer Studies in Mathematics

Grades 9-11, 6 weeks, residential. Rolling admissions. *HCSSM*, Hampshire College, Box NS Amherst, MA 01002; (413) 559-5375; [www.hampshire.edu/~kmdSP/Math.html](http://www.hampshire.edu/~kmdSP/Math.html)

### Program in Mathematics for Young Scientists

Grades 9-11, 6 weeks, residential. Applications accepted March 1-June 1. *PROMYS*, Department of Mathematics, Boston University, 111 Cummington Street, Boston, MA 02215; (617) 353-2563; [math.bu.edu/people/promys](http://math.bu.edu/people/promys)

### Ross Young Scholars Program\*\*

Ages 14-17, 8 weeks, residential. *Ross YSI*, The Ohio State University, 100 Mathematics Building, 231 W. 18th Avenue, Columbus, OH 43210; (614) 292-1569; [www.math.ohio-state.edu/ross/](http://www.math.ohio-state.edu/ross/)

\*\* NSF-sponsored program. To learn about other subsidized science and math Young Scholars Programs, call the National Science Foundation. (703) 306-1616.

## STUDY ABROAD

### CTYI, Dublin

Ages 12-16, 3 weeks, residential. *The Irish Centre for Talented Youth*, Dublin City University, Dublin 9, Ireland; 353-1-7045634; fax 353-1-7045693.

### Duke TIP International Summer Study Trips

Grades 8-11, 3 weeks; England, Germany, and Italy. *Duke University Talent Identification Program*, Box 90747, Durham, NC 27708-0747; (919) 684-3847; [www.tip.duke.edu](http://www.tip.duke.edu)

### International Summer Science Institute

Grade 12 with independent research experience, 5 weeks, study and travel in Israel. Deadline: March 1. *International Summer Science Institute*, American Committee for the Weizmann Institute of Science, Suite 117, 51 Madison Avenue, New York, NY 10010; (212) 779-2500; fax (212) 779-3209; [www.weizmann.ac.il](http://www.weizmann.ac.il)

### Oxbridge Academic Programs

Grades 10-12, 4 weeks, England and France. *Oxbridge Academic Programs*, 601 Cathedral Parkway 7R, New York, NY 10025-2186; (800) 828-8349 or (212) 932-3049; [www.oxbridgeprograms.com](http://www.oxbridgeprograms.com)

Ask about precollege programs at local colleges and universities, and consult these guides:

### Computerized Database of Summer Programs for Gifted and Talented Students

Sandra Berger, The Council for Exceptional Children, 1920 Association Drive, Reston, VA 22091; (800) CEC-READ.

### Educational Opportunity Guide: A Directory of Programs for the Gifted (1999, \$15.00)

Duke University Talent Identification Program, 1121 W. Main Street, Suite 100, Durham, NC 27708-0780; (919) 683-1400.

### Program Opportunities for Academically Talented Students (1996, \$10.00)

IAAY Office of Public Information, The Johns Hopkins University, 3400 N. Charles Street, Baltimore, MD 21218; (410) 516-0245.

### Summer on Campus: College Experiences for High School Students (1995, \$15.00)

Available in bookstores or from Department A40123, College Board Publications, Box 886, New York, NY 10101-0886.

### Summer Opportunities for Kids and Teenagers (1998, \$29.95)

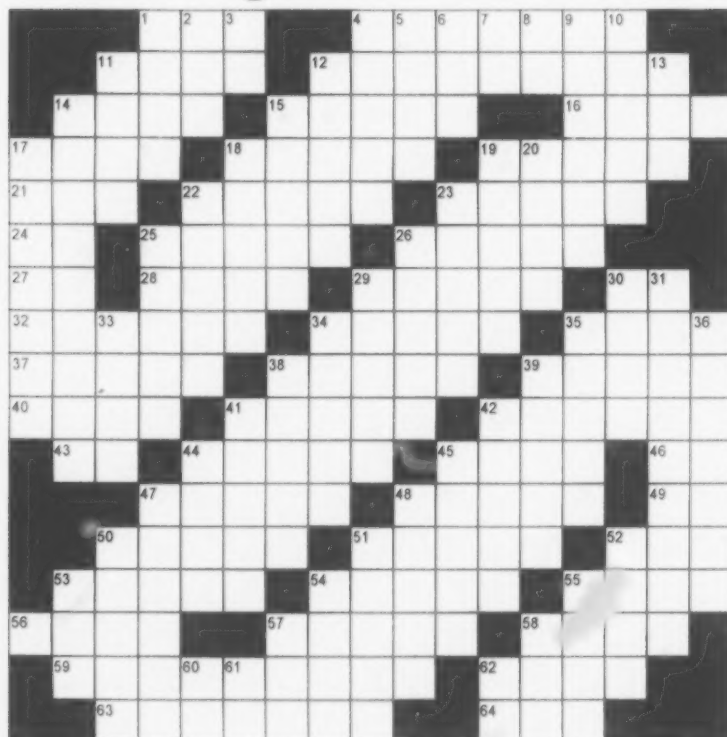
Available in bookstores or from Peterson's Guides, P.O. Box 2123, Princeton, NJ 08543-2123; (800) 338-3282.



# WORD WISE

by Carol Blackburn

## To Engineer is Human<sup>\*</sup>



Constructed using Crossword Weaver

### ACROSS

- |                       |                                      |                                 |
|-----------------------|--------------------------------------|---------------------------------|
| 1 Sin's partner       | 26 Electromotive force units         | 40 Olden times                  |
| 4 The Renaissance man | 27 DC's alternative                  | 41 Croatian electrical engineer |
| 11 Danish physicist   | 28 Tease, in Berlin                  | 42 French structural engineer   |
| 12 Outdated machines  | 29 Control mechanism                 | 43 Right side (abbr.)           |
| 14 Bivalve            | 30 Element # 14                      | 44 British sailor               |
| 15 New York borough   | 32 German mechanical engineer        | 45 Annoying insect              |
| 16 Wander             | 34 Clean out                         | 46 Cu's neighbor                |
| 17 ___ safe           | 35 What a well-tuned engine does     | 47 Models                       |
| 18 Pokes              | 37 "A body _____ tends ..." (2 wds.) | 48 Mathilda, to her friends     |
| 19 Police man         | 38 American cryptographer            | 49 Charleston locale            |
| 21 Killer ___         | 39 Italian physicist                 | 50 Groups of eight bits         |
| 22 ___ Sawyer         |                                      | 51 Outcomes                     |
| 23 Like rubber cement |                                      |                                 |
| 24 Radium (abbr.)     |                                      |                                 |
| 25 Chutzpah           |                                      |                                 |

- |                               |                           |
|-------------------------------|---------------------------|
| 52 Medium earth orbit (abbr.) | 25 Museum, in Paris       |
| 53 DNA sequences              | 26 Vice ___               |
| 54 Town or Jon                | 29 Rude                   |
| 55 Solution (abbr.)           | 30 Explore, in cyberspace |
| 56 Space agency               | 31 Hugely                 |
| 57 Entreaties                 | 33 Makes a mistake        |
| 58 Depend                     | 34 Models                 |
| 59 Time is the fourth         | 35 Beefy                  |
| 62 Fencing sword              | 36 ___ Valley             |
| 63 Twisting force             | 38 Messages               |
| 64 Current unit               | 39 Italian autos          |

### DOWN

- |                                                                    |                            |
|--------------------------------------------------------------------|----------------------------|
| 1 Anthracite                                                       | 41 ___ tables              |
| 2 Resistance measure                                               | 42 Record data             |
| 3 Strontium (abbr.)                                                | 44 The summer, in Cannes   |
| 4 Light-emitting ___                                               | 45 Famous Harvard drop-out |
| 5 Artificial neural networks (abbr.)                               | 47 Electric generator      |
| 6 Voice (Lat.)                                                     | 48 Yucatan native          |
| 7 State of being                                                   | 50 To suit (poetic)        |
| 8 Sodium (abbr.)                                                   | 51 Air-conditioning gas    |
| 9 Marie and Pierre                                                 | 52 $6.02 \times 10^{23}$   |
| 10 Humor                                                           | 53 E ___!                  |
| 11 Radar echo                                                      | 54 Oscar for advertisers   |
| 12 Unmanned aircraft                                               | 55 Flow out slowly         |
| 13 Droop                                                           | 57 Pressure measurement    |
| 14 A pair of oppositely charged conductors                         | 58 Angular velocity        |
| 15 Biological CPU                                                  | 60 TV show                 |
| 17 Discovered that a magnetic field can induce an electric current | 61 Not significant (abbr.) |
| 18 Tiny image element                                              | 62 Equal access (abbr.)    |
| 19 Figure out                                                      |                            |
| 20 "And ___ too?"                                                  |                            |
| 22 Catnaps                                                         |                            |
| 23 Ravine                                                          |                            |

<sup>\*</sup> The title of a book by Henry Petroski (Vintage Books, 1992).

Review by  
Diane Clavier & Kimberly Nolan

**Kimberly:** Re-reading *Sense and Sensibility* certainly is a pleasure, isn't it, Diane? I'm always amazed at the discoveries I make each time I revisit a Jane Austen novel.

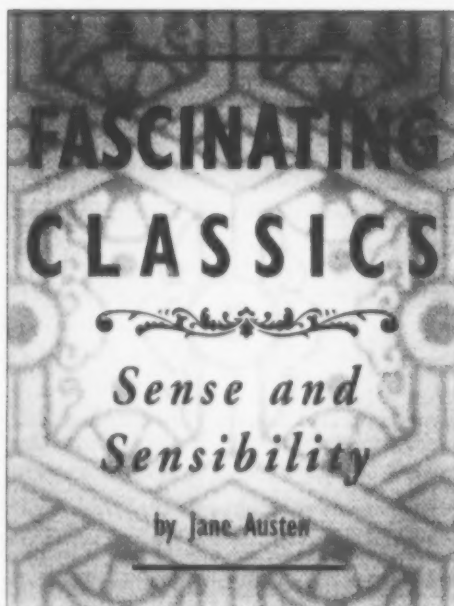
**Diane:** I enjoy my favorite novels as much when I return to them after some time has passed, and Austen's work is particularly satisfying. When I first start reading, I'm delighted by previously overlooked points of style and irony, and before I know it, I'm engrossed in the story. So I was surprised that upon picking up *Sense and Sensibility* for the second time, I found it a little hard to get into. The subject matter and tone of the first few chapters—in which we read about the legal intricacies of Mrs. Dashwood's abrupt change in fortune—can be a bit off-putting.

**Kimberly:** You're right; the novel starts on a sour note. John and Fanny Dashwood agree to disinherit the recently widowed Mrs. Dashwood and her daughters—a particularly unpleasant scene. John Dashwood completely disregards his father's dying request that he care for his stepmother and half-sisters. Then, at his wife's urging, he justifies his greed by suggesting that his father's request extended only to helping them move from Norland, now his sole property, into a new home.

Still, we see Austen's biting humor right from the start. The thought process by which John and Fanny arrive at this conclusion is really quite comic. Their complete lack of familial affection coupled with their unbridled greed make them obvious foils for the other characters.

**Diane:** That's true; the finer qualities of the Dashwood sisters are apparent from the novel's outset. But despite their similarities in taste and education, Marianne and Elinor Dashwood represent two distinct approaches to life, each of which is equally valuable.

I didn't fully recognize this the first time I read *Sense and Sensibility*. I saw the Dashwood sisters as polar opposites and thought Austen approved only of Elinor's "sense." She is practical, wise, and restrained; she exercises good judgment and seems to stick to her own sense of what's right. Marianne is opinionated, capricious, emotional, and



easily swayed by outside influences. I did not fully see the merits of Marianne's "sensitivity."

**Kimberly:** To a certain extent, the sisters do represent "sense and sensitivity," but the title also refers to two states of being—the apparent split between the mind and the heart. Austen suggests that this split must be negotiated. Since neither head nor heart should rule, the qualities each sister possesses are not mutually exclusive. Rather than thinking of Marianne and Elinor as opposites, I prefer to think of them as complements to one another.

**Diane:** That's an intriguing thought, Kimberly, and I believe you've hit at the core of the novel. This story of two sisters and their respective romantic attachments provides us with a rich discussion of personal and social responsibility while stressing the need for empathy and sensitivity. As the story progresses, the sisters move toward a balance of head and heart that makes each a more complete person.

**Kimberly:** This novel is, in many ways, about growth and change. And the Dashwood sisters make many changes—starting with the move from Norland into a new home and a different society.

**Diane:** Yes, and at first the move from Norland seems like a step down for the sisters. They leave the large society estate and settle in a small cottage, with a significant reduction in income and standard of living. But is it truly a move down?

**Kimberly:** This is a clear social commentary by Austen. She portrays the move not as a reduction in social status, but as a transition from bad company to better. I, for one, was glad to see them settled in Barton Cottage no matter how reduced their circumstances.

**Diane:** I agree. The warmth and solicitude of the Barton crowd far outweigh the wealth and consequence of the higher society that the Dashwoods leave behind. But the move from Norland to Barton Cottage is significant for other reasons, too. In particular, I am struck by Marianne's thoughts on taking leave of her home:

*Dear, Dear Norland!—when shall I cease to regret you!—when learn to feel a home elsewhere? Oh happy house, could you know what*

## FROM SENTIMENTALITY TO SOCIAL SATIRE

by Diane Clavier

Jane Austen began writing *Sense and Sensibility* as an epistolary (written as a series of letters) novel called "Elinor and Marianne" in 1795 at the age of 20, and reworked it many times before publishing it in 1811. Modern readers might easily misunderstand the current title, considering "sense" and "sensitivity" to be synonyms. But "sensitivity" has changed meaning in the past 180 years—in Austen's day, "sense" referred to reason, common sense, and mind, whereas "sensitivity" denoted emotion, sensitivity, intuition, and heart.

With this title, Austen responded to the literary tradition

of the 18th century, which was dominated by the sentimental novel. Characterized by innocent and hyper-sensitive heroines, rapacious rogues, tender-hearted heroes, and frequent weepy episodes, sentimental novels were all the rage during Austen's youth. The romantic Marianne resembles and even emulates sentimental heroines in her emotionalism, but has enough intellectual and social support to avoid lasting calamity.

Austen's work, like sentimental fiction, focuses on relations between the sexes. But Austen views courtship through a very

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*I suffer in now viewing you from this spot, from whence perhaps I may view you no more!*

Austen shows us Marianne's sensibility in all its glory. But her sadness at leaving her home of 17 years is heartfelt, if a little overstated. Marianne and the others adapt quite readily to their new surroundings. As they arrive at their new home, "their interest in the appearance of the country which they were to inhabit overcame their dejection, and a view of Barton Valley as they entered it gave them cheerfulness." The introduction of Mr. Willoughby seems to ease Marianne's suffering for dear, dear Norland at once.

**Kimberly:** Barton Cottage turns out to be quite a haven for the Dashwood sisters. Yet, while Marianne's romance with Willoughby seems to flourish, Elinor silently pines for Edward Ferrars.

**Diane:** While Elinor maintains utter secrecy, Marianne's affection is too flamboyant. So Elinor obsesses over her sister's reckless behavior while trying to deny her own heartbreak over the apparently unobtainable Edward. And she refuses to admit her true feelings for him:

*"I do not attempt to deny," said she, "that I think very highly of him—that I greatly esteem, that I like him."*

*Marianne here burst forth with indignation—"Esteem him! Like him! Cold-hearted Elinor! Oh worse than cold-hearted! Ashamed of being otherwise. Use those words again and I will leave the room this moment."*

Marianne's response is certainly humorous, but she makes an important point. Elinor is uncomfortable with her own feelings—even ashamed of them. And Edward is just as reluctant to admit his affection for Elinor. In fact, he stays engaged to a woman he does not love because he overvalues honor and duty. His desire to obey the rules of society regardless of the emotional consequences nearly leads him into a disastrous marriage.

**Kimberly:** Marianne also falls into an ill-fated relationship, but for completely different reasons. She is swept off her feet by the dashing and romantic Willoughby. With complete disregard for social norms, Marianne pursues Willoughby, even after she has been publicly rejected!

**Diane:** Marianne's recklessness ultimately leads to her near-fatal illness. But Marianne's illness does both sisters good—allowing Marianne to see the error of falling into excessive "sensibility" and

Elinor to express her pent-up emotions in a fever of concern for her sister's life.

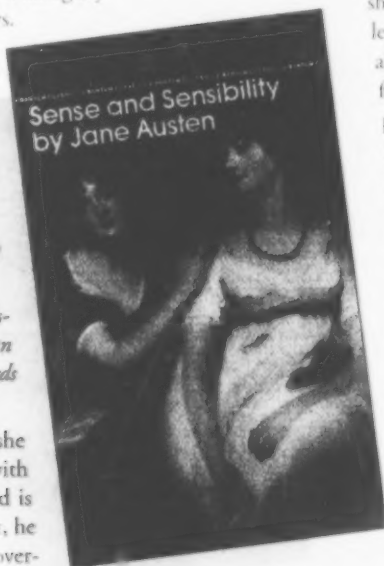
**Kimberly:** Thank goodness Marianne has another suitor, Colonel Brandon. And although she makes disparaging comments about his age (35!) and health, there is a moment after they first meet, when Colonel Brandon demonstrates his own sensibility. Brandon's appreciation of music, and Marianne's respect for his taste and discernment foreshadow the real attachment in Marianne's future and the novel's happy conclusion. Still, the young woman at the end of this story is very different from the ebullient 17-year-old of the first few chapters.

**Diane:** Marianne becomes a calmer and more reflective person as she and Elinor make the transition from adolescence to adulthood. By this time, they have also experienced the social change of being forced out of the gentry class and turned into poor relations dependent on the largess of others. Although they eventually rejoin the gentry, Austen shows them moving gracefully in either social circle. Character, not wealth or status, becomes their basis for judging others.

**Kimberly:** Austen frequently reiterated the idea that intrinsic values such as kindness, good judgment, and a generous nature matter more than extrinsic characteristics such as income or the grandeur of one's estate. By showing the individuality of virtue, Austen challenged the eighteenth-century belief that a person's worth is determined by social status.

**Diane:** She also ridiculed those who overvalued social status. Readers who accuse Austen of snobbery misinterpret her. In fact, much of Austen's criticism is directed at snobs—and this criticism is usually funny and occasionally quite biting.

**Kimberly:** Austen uses humor and irony to tackle universal concerns like dishonesty, petty cruelty, and greed. But despite the weight of her subject matter, we must beware of taking everything she says at face value. Her tongue, as when she describes the four-bedroom Barton Cottage as "small," is often in her cheek. To get the most out of Austen, we need to look beyond first impressions as we read. ■



different lens, zeroing in on issues of social and financial instability, education, and personal growth. With a basic framework borrowed from sentimentality, *Sense and Sensibility* draws on the earlier eighteenth-century tradition of rationalism and order to reject maudlin sensibility. And its subtle (but occasionally vicious) satire of fashionable snobs, shallow social climbers, and insensitive bores is an achievement at which many readers stand in awe.

Austen wrote six major novels before she died in 1817. She was, by contemporary standards, wildly successful. And

although some critics accuse them of narrow vision and social conservatism, Austen's novels integrated revolutionary concepts about individualism, predicted the impending rise to prominence of the middle class, and recognized the growing demand for education and legal autonomy reflected in nascent feminism.

#### Upcoming Fascinating Classic:

Carson McCullers, *The Heart is a Lonely Hunter*

# EXPLORING CAREER OPTIONS: PUBLIC AFFAIRS

## Interview with Paul Freeman

by Carol Blackburn

*A city councilman for Laguna Beach, a town of 24,000 in southern California, and Director of Community & Government Relations for a local firm, Paul Freeman has worked with "the system" from both inside and outside the government.*

*What is public affairs?*

Put simply, it's politics plus. It includes everyone who works in electoral or legislative politics plus many people who either influence or carry out government policy: from lobbyists, political pollsters, and campaign managers to regulatory compliance experts and "policy wonks" or experts. Thousands of people are professionally involved in the process of making and implementing decisions about our communities.

*How are you involved?*

I work in public affairs in both the public (that is, government) and private (business) sectors. As an elected city councilman, I help my community manage its daily affairs, cope with emergencies (like the fires and mud slides coastal southern California has recently experienced), and formulate long-term plans for community development. Recently, for example, we decided to replace the drainage system that runs through the center of town. Instead of just fixing the immediate problem, we are using it as an occasion to think about the city's future, asking whether there are any other improvements we should make as long as we are tearing up the streets.

*And in the private sector?*

I'm Director of Community & Government Relations for Segerstrom & Sons, a real estate development partnership. I manage the firm's land-use planning and represent them before state and county planning commissions and agencies. My current projects include working with



other county leaders to plan a new light rail system that will cut across some of the Segerstrom properties.

The community relations aspect of my job includes overseeing the firm's philanthropic activities. Communities increasingly rely on "public-private" partnerships—projects funded jointly by government and business. The Segerstrom family has strong ties to the community and has funded many projects, including Orange County's Performing Arts Center. We also support groups working in disadvantaged areas to address basic human needs such as housing, food, health care, and job creation. Sending Segerstrom charitable dollars to worthy local causes is one of my favorite responsibilities.

*When did you decide on public affairs?*

I've been a political junkie since I was a kid. When I was ten, I berated my parents for supporting a candidate—Barry Goldwater—who had voted against the 1964 Civil Rights Act. In high school, I read *The Federalist Papers* and was blown away by the extraordinary mix of idealism and unblinking realism shown by the founding fathers. They were painfully aware that whatever system of government they

set up, people would try to circumvent it for their own ends. They were terribly concerned about some of the things that are happening now, like the disproportionate power of special interest groups. I was really impressed by the intricate system of checks and balances they created in an effort to protect their new nation from the socially destructive propensities of human nature.

In college, I continued to enjoy history and government—my majors—but the experiences that most spurred my interest in public affairs were extracurricular. During the summers, I worked as a congressional intern on Capitol Hill, where I sat in on Senate debates and hearings. I was actually on the floor of the House when they voted to cut off funds for the Vietnam War. It was an incredible experience.

*What did you do after college?*

As a result of my summer internships, I was hired as a junior legislative assistant to Senator Gary Hart (D, Colorado). My summers on the Hill had introduced me to the work of a congressional staff member, but nothing could truly prepare me for the responsibility of that job. I vividly recall the first time it hit me what I had gotten myself into. I was asked to learn about an issue, then recommend how the Senator should vote on an upcoming bill. After researching it, I said to the Senator's legislative director, "There's a dearth of good information on this. I'm really at a loss as to what to recommend." He looked at me like I was completely clueless and said, "That's what you get paid for—to make a judgement. You have to tell the Senator how to vote." It was a scary moment!

*It sounds it. Is it common to learn on the job rather than in a graduate program?*

It is. Unlike law, for example, there's no required training. Majoring in government or public policy is helpful, but the basic skills fostered by a strong liberal arts education—the ability to think critically, to do research, to write well, and to express yourself clearly—are far more important. Some people do pursue graduate training in law or public policy. The latter includes courses in government, management, interpreting demographic trends, and case studies of how communities handled particular public projects.

### *Sort of a public sector M.B.A.?*

Yes, but with the important difference that in public affairs, unlike business, there's no one "bottom line" that can be used to evaluate the success of a program or initiative. Instead, there are many measures—economic productivity, public health and safety, public opinion, effective public education—and people vary enormously in the relative values they place on these indicators.

In one policy course I took, the final exam was a single essay question: "Is there such a thing as 'the public interest'?" If you answered yes, how would you define it? The greatest good for the greatest number? Doing

amazes me how many people in this business expect to get their own way, not understanding that give-and-take is the heart, the guts, of our system of government. "It's my way or the highway" was not Jefferson's philosophy of government; it was Stalin's.

### *What did you do next?*

Senator Hart was selected to chair a National Commission on Air Quality, and he asked me to be his assistant. The Commission included members of Congress, public health experts, and representatives of both the major polluters and major environmental interest groups. My job was to

career. Ultimately, Mondale, not Hart, won the nomination. Hitching one's wagon to the wrong star is a very common experience in public affairs, where most people with an eye on the White House don't get there. Still, I gained a great deal from my experience with Hart, including the contact that brought me to California. Here, I've worked as a consultant to nonprofit organizations, universities, corporations, and now Segerstrom.

### *You've had a lot of jobs. Is that usual?*

Yes. Many jobs within public affairs are inherently time-limited, like working on a campaign, on a task force, or for an elected

## SAVE THE CANYON



*Campaign poster from the Laguna Canyon bond referendum. Courtesy of the Laguna Canyon Foundation.*

good for those who need it most? Doing something that does little good now but provides a foundation for the future? Whether you learn in a graduate program or on the job, you have to grapple with the fact that there's rarely one right answer in this work.

### *That does sound challenging.*

The absence of a common training or a generally agreed-upon measure of success is part of what makes public affairs such a contentious world. People enter it with vastly differing ideas of what should be done and how to do it. Many also bring expectations wholly different from those they bring to every other relationship in their lives. In a marriage or friendship or business, you must compromise. You don't say unforgivable things to people with whom you have an ongoing relationship. It

talk with all the Commission members before each public meeting, to ensure that they were satisfied with the veracity of the findings to be presented. We knew there would be disagreements, but in our public meetings, we wanted them to focus on questions of policy, not fact. It was a fascinating opportunity to work with people whose perspectives and goals were extremely different, yet who had to agree about some things—the facts—even if they did not always agree about what we should do in response to those facts.

By the time the Commission concluded, Senator Hart was a Democratic Presidential hopeful. I became an organizer and advisor for his crucial New Hampshire primary campaign. The success of that election was a real thrill—one of the high points of my early

official. Political fortunes rise and fall, and issues wax and wane in importance. You have to be enterprising and resourceful, able to use your skills in a variety of venues.

People in public affairs also tend to have a variety of jobs because much of the expertise they develop involves *process* rather than *content*. What does that mean? Content expertise is factual knowledge about a topic, like air pollution. Process expertise is "how to" knowledge—how to organize a campaign, draft legislation, lobby, conduct polls—and such expertise can be used in many ways. Given the instability of the political landscape, people with process expertise often end up using their skills in a range of projects. I've worked on projects concerning everything from land use planning to health care to telecommunications.

My skills in negotiation, coalition building, public relations, and strategic planning are what have enabled me to do so.

*Could you give us a closer look at a project that has used those skills?*

Certainly. One of my most rewarding projects was negotiating a public land purchase. Laguna Beach lies between the ocean and hills. In the mid-'80s, about 2,500 acres of those hills—an area known as Laguna Canyon—were still undeveloped. A private real estate company owned the land and had plans to develop it, but many local residents and environmentalists wanted the public to acquire the land as permanent open space. It would have linked other open space in the area, creating a 16,000-acre greenbelt. Laguna Canyon had some of the most environmentally valuable land in the whole proposed greenbelt, including the only natural lakes in the area. For 15 years, a legal dispute had raged over the fate of the Canyon, as environmental groups sued to halt development and the landowners counter-sued to be permitted to develop the land. Finally, community leaders decided to try to resolve the dispute.

*How did you become involved?*

I was hired as an independent consultant to facilitate an agreement. I was not yet a city councilman, but I had met and earned the trust of people in both the environmental and business communities. To be honest, I was selected in part because I was everyone's second choice for the job—you see, no one wanted their opposition's first choice to oversee the negotiations.

Before we got started, I did a lot of research on my own, studying the land's history, the personalities of all the parties involved, and negotiations of other open space purchases.

Once we began, we agreed on some ground rules: I would handle all press releases—premature press leaks could have poisoned the negotiations—and throughout the negotiations, we would do nothing without unanimous agreement.

*Didn't that make your job a lot harder?*

Yes, but I felt it was essential. The long-standing dispute had created bitter feelings. I wanted the parties to begin to agree on things, even if only guidelines, to break the ice before the harder negotiations to come.

We first identified the areas of the Canyon most important to preserve as open space, then moved on to the more difficult task of defining parameters for development of some of the land, which was clearly inevitable. Eventually, we came up with parameters that everyone could accept: only land that lay outside the Canyon watershed would be developed. Since that land is technically not part of the Canyon, this solution gave the environmentalists room to acquiesce to limited development without feeling they were letting their supporters down.

*That sounds like a big step.*

It was, but it wasn't the end of the battle. The landowners weren't going to donate their land to the city; if the citizens of Laguna Beach wanted that land, they would have to pay for it by voting to increase their own property taxes. Early in the negotiations, I polled residents on how much of a tax increase they would support to purchase how much land. We limited all subsequent negotiations using not only environmental data but also public opinion data.

*The voters were, in a sense, another party at the negotiating table?*

Yes. They would be the ultimate arbiters of the success of our negotiations. We finally worked out an agreement whereby the landowners would forego most of their development plans and the city would purchase 1,781 acres as permanent open space—if Laguna Beach residents would vote to raise their property taxes an average of \$250 a year over the next twenty years.

*So, after months of intense negotiations, you had to shift gears and persuade the voters to support the purchase?*

Yes. At last the issue came to a public vote. My final responsibility was to run the campaign to pass the bond referendum to purchase the land. I was already working on the campaign long before the negotiations were over. I met with crucial voter groups like the Laguna Beach Parents' Association to gain their support. We made targeted, get-out-the-vote mailings to demographic groups likely to support the referendum.

We put up huge signs on the only road through the Canyon saying, "Imagine 3,000 homes here." We wanted to make the alternative future—the fate of the Canyon

if the city didn't buy the land—very real to the voters. In the end, 79.7% voted yes—the highest vote in California for a tax hike since 1956.

*That must have been very satisfying.*

It was. It wasn't easy. I often wondered whether we could reach an agreement by Election Day. But the result of all our efforts was something of lasting benefit to the community.

*We haven't talked about the dark side of this business. What do you find most difficult about it?*

You mean besides fund raising? The dark side of this work is inherent in the process: in order to get anything done, you *have* to make compromises, and that often means compromising with people whose agendas you do not share. But unless you're willing to give in on some things that are important to others, you won't have the leverage to ask them to give in on things that are important to you.

The only way to survive all the political horse-trading with your integrity intact is to have a well-developed hierarchy of values. Only then can you approach different issues with varying degrees of willingness to compromise. And only then can you hope to accomplish some of the things that really matter to you.

*Do you have any final words?*

There's no denying that public affairs can be frustrating. But for me, it has also been very interesting and sometimes even spiritually uplifting. I once read a book that defended politics as a noble profession, arguing that because so much is at stake, you can do either a great deal of good or a great deal of evil. Some of the things I've been able to do are of enduring value. When I look at Laguna Canyon, or the success of some of the programs we've supported throughout the county, I know I have made a difference. ■

## Selected Resources

Smith, Hedrick. *The Power Game: How Washington Works*. New York: Ballantine Books, 1996.



## PLANNING AHEAD FOR COLLEGE

### Dual Enrollment Programs: Part-Time College for High School Students

by Linda E. Brody, Ed.D.

**I**N THE LAST ISSUE OF *Imagine*, we described early college entrance programs, an option for students eager to enroll full-time in college at a young age. But early entrance isn't for everyone.

You may want to stay in high school so that you can be in a position of leadership during your senior year. Or perhaps you feel challenged in most classes but are just running out of math courses. Maybe your dream is to attend an out-of-state, highly selective university and you would like to enter at the typical age of other freshmen. For students who would like the challenge of college-level courses while still in high school, dual enrollment in both high school and college courses is becoming an increasingly popular option.

#### Dual Enrollment Legislation

Twenty-two states have passed legislation that allows qualified high school students access to college courses, often at no cost to the student. Referred to as Dual Enrollment or Postsecondary Options, the idea appears to be spreading rapidly across the country. At present, programs vary considerably among states with regard to which students may participate, how many and which courses they may take, and whether they earn high school and/or college credit.

The most comprehensive programs have been adopted by Colorado, Florida, Georgia, Maine, Massachusetts, Michigan, Minnesota, New Jersey, Ohio, Utah, Washington, and Wisconsin. Students in these states pay little or nothing to take college courses, earn both high school and college credit, and encounter few course restrictions.

Less generous programs exist in Arizona, Arkansas, Indiana, Kansas, Louisiana, and North Dakota, where students pay the tuition for their postsecondary courses. Students will also find more restrictions on choice of courses and credit, but the right of some students to take college courses is still assured.

Iowa offers the program at minimal or no cost to students, but courses count only toward high school graduation, not for college credit. And Oregon offers college courses for credit in high schools. Students pay a greatly reduced fee, but can take only specified courses. Finally, Nevada and Oklahoma are currently initiating programs.

If you live in one of the above states, contact your guidance counselor or State Department of Education for more information. If your state isn't on this list, you can, of course, enroll in a local college on your own or take a college course via distance learning. But you will have to pay the tuition and work out the logistics for yourself. Meanwhile, you might want to lobby your state legislators to pass Dual Enrollment legislation in your state. Remind them that these programs provide an appropriate education for all high school students without the added cost of creating new courses to meet the

needs of those who require advanced study. You might also mention that policy-makers consider dual enrollment a good way to keep talented students at in-state colleges, where they're more likely to retain the college credits they've earned.

#### Speaking of Credit

Colleges have varying policies on granting credit for college courses taken during high school. Some colleges will allow you to transfer the credits, especially if you stay in your own state, but many colleges will not. Most colleges will let you place out of intro-level courses if you've already mastered the work, so earning credit may not be important to you unless you plan to graduate from college in less than four years. If credit is important to you, you will probably benefit more from taking Advanced Placement exams, with or without having taken AP courses, as more colleges give credit for AP work than for college courses taken by high school students. (Note that some states have also passed legislation to pay the fees for students' AP exams. The next "Planning Ahead for College" will focus on the AP program.)

Dual enrollment offers many rewards beyond credit. Taking rigorous college-level courses can prepare you to succeed in college by developing your study skills and providing content knowledge. If you take courses on a college campus, the exposure to campus life can help you define what you want in a college when you are ready to select one. It can also help you become more independent. And, when you apply for full-time college admission, success in college-level work will show admissions officers that you are ready to be a successful college student.

**I**f you do use dual enrollment to accrue college credit and enter college with a year or two of college work behind you, you can save yourself (or your parents) considerable college tuition, and give yourself a big head start in time, which could be important if you are planning a career that requires many years of graduate or professional school or other training. ■

You can find more information about individual state policies on the Education Commission of the States Web site at [www.ecs.org/ecs/ecsweb.html](http://www.ecs.org/ecs/ecsweb.html)

#### APPLYING TO COLLEGE?

Past issues of *Imagine* include reviews of

Stanford Washington U. Johns Hopkins  
Yale Brown Princeton U. of Michigan  
Amherst Columbia MIT Harvard Rice  
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*The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.*

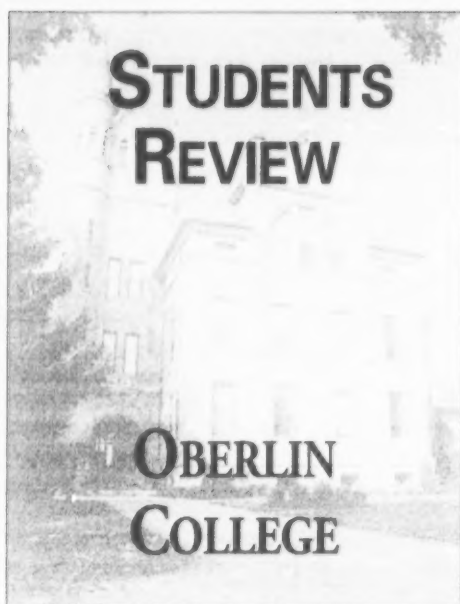
Our reviewers include eleven students, who major(ed) in anthropology (1), art history (1), biology (2), creative writing (1), East Asian studies (2), English (2), French (1), history (1), labor relations (1), Latin American studies (1), politics (1), religious studies (2), studio art (1), and women's studies (1). (The number of majors exceeds eleven because most students have double majors.) Students' comments appear within quotation marks.

### Quality of Academic Instruction for Undergraduates

Reviewers spoke glowingly of the faculty's commitment to challenging the students and of the students' sincere desire to be challenged. One of the country's top liberal arts colleges, Oberlin also has a first-rate music conservatory. Qualified students may pursue a five-year, dual-degree program in which they complete both a liberal arts B.A. and Bachelor of Music degree.

"Oberlin is an institution like no other. It has consistently produced more Ph.D.s than any other four-year liberal arts college. Interaction with faculty is very good, excellent in the conservatory and nearly excellent in the social sciences and humanities. Professors are very accessible and without exception encourage students to come talk with them. I have been extremely satisfied with mine. Each has brought new insight into my life and conveyed a strong passion for learning and understanding the world. The students are critical thinkers, thoughtful about society, and excited about learning."

"Amazing. The dedicated professors take an active interest in their students. In some intro science classes, size exceeds 100, but in the one large science class I took, the professor knew my name by the second week. Most of my classes have had around 30 students, and some fewer than 10."



"Since Oberlin is a liberal arts college, undergraduate instruction is the primary focus and is usually excellent, though it varies from professor to professor. Courses are generally pretty intense, and graded that way."

"The academic resources are unbelievable, especially at the Art Museum, where I've been able to view anything in the collection, not just what's on display. The staff has brought items out of storage, even if they were not for a class. It's obvious that students are the school's first priority."

"The curriculum is very open, with no core courses and very few requirements: just nine credit hours in social sciences, nine in natural sciences, and nine in arts and humanities. The 9-9-9 system makes it easy to explore different disciplines without being stuck in large intro courses. And academic resources are excellent for a college this size. The library system, in particular, is quite large for a small liberal arts college—over two million items. The scientific resources are good but not wonderful."

### Social Life

Oberlin's academics are strong, but it is the social atmosphere that makes the school unique.

"Oberlin is a thriving, crazy place. I found the people to be generally fascinating—intelligent and just a little weird. There's no social hierarchy—no cool crowds or cliques, a tremendous relief after high school. I love it—

there are tons of interesting, smart people and a million clubs. Oberlin students love to start things and join things."

"Oberlin tends to attract a lot of people who didn't fit well into high school. One of my school friends accused me of being 'just another non-conformist, like the rest of them.' Obies are usually extremely active, either politically or socially. The strongest sub-communities tend to be in the co-ops (dining and housing) and the program houses (language, ethnic and area studies). The co-ops are entirely student run, and it's really powerful to be part of such a large, collective student effort."

"The school is kind of in the middle of a cornfield. Some long for the city, but I never get bored. No one will deny that Oberlin is isolated, but the college makes up for it by attracting great people to be around. Students are very liberal and not at all preppy. The isolation and small size contribute to the sense of community; whenever something is going on, you know just about everyone there."

"Social life tends to revolve around hanging out with friends and attending campus activities (concerts, plays, the campus dance club). You can find people engaged in just about any social activity—having philosophical discussions, going shopping, dancing folkloric dances, getting stoned, etc. You can also avoid just about any part of the scene, except possibly the long discussions."

"Tiny school, lots of stuff. There's always something going on; it would be impossible to do everything you would like to do at Oberlin. If you don't have a car, you're 'stuck' in town (which has about three main streets). However, the powers that be go to a lot of trouble to make sure we have plenty to do, and the Conservatory of Music offers concerts of one kind or another almost every night. The co-op system is also an amazing way to meet people and be part of a 'family.'"

"It depends what you mean by 'social life.' Most students are too absorbed in their studies or activities (political, service, or artistic) to have much of a social life. The college is located in the middle of the Ohio wasteland. Cleveland is rumored to be just 45 minutes away, but no one ever seems to go there. Cultural programs, on the other hand, are excellent—a good film series, great concerts for every musical taste (by both imported professionals and students in Oberlin's first-rate conservatory of music), and a pretty decent theater department. The dance club is also very popular. For the most part,

though, Oberlin students enjoy relaxed, uneventful evenings with a small group of friends—not a bad proposition, but one that does get tedious every so often.”

### What Do You Like Best about Oberlin?

“The opportunity to explore and redefine myself. Within the first month, I crawled out of the shy shell I was in during high school. For the first time since pre-adolescence, I felt like myself, not what I thought other people wanted me to be. This has a lot to do with the liberal, open-minded attitude at Oberlin.”

“The genuine intellectual dedication that is the norm, which makes learning from fellow students easy. And the intimacy of the better classes: the majority of my professors viewed education not as an interaction between a lecturer and a crowded classroom, but as a series of one-to-one relationships.”

“The people. The small community atmosphere. The level of interaction. The feeling that right outside my door are thousands of potential conversations that will challenge me.”

### What Do You Like Least about Oberlin?

Most reviewers noted limitations common to all small liberal arts colleges located in small towns. A few had more specific observations.

“Instruction is good, but lack of faculty continuity can make it difficult to develop ongoing relationships with professors in some departments. The Studio Art department, for example, has not tenured anyone in 15 years; most faculty are in one- or two-year temporary positions. I’ve had to change my advisor four times so far. Similar problems exist in the History and Politics departments.”

“I wish there were more diversity in the administration and faculty. I wish there were more community activism, not just talk. The people in the career services office are very kind and helpful, but I wish they were more attuned to the fact that people with liberal arts degrees do not automatically find a career track.”

“Despite the justifiably vaunted diversity of the student body, there is an underlying sameness to many of them. The typical student comes to Oberlin as the most

interesting person he/she knows, and isn’t very happy to surrender that position. He/She is also usually in the awkward position of being alienated from society in some way yet simultaneously privileged (a \$25,000-a-year education is undeniably a great privilege). Too often, students compensate for this confusion by adopting a sort of militancy for whatever dogma (left, right, artistic, even apathetic) comes to hand.”

### Who Would Be Most Compatible with the Academic and Social Atmosphere at Oberlin?

“Someone intelligent and intellectual, who would rather stay up until 5 a.m. having a

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#### OBERLIN COLLEGE Oberlin, Ohio 44074 800-622-6243

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- 4-year private coed college and music conservatory
- Campus in a small town in rural Ohio
- Full-time undergraduate enrollment 1997-98: 1,222 men, 1,685 women
- Special features: Conservatory of Music, and the third-ranked college or university art museum in the country, after Harvard’s and Yale’s

heated political discussion with housemates than attend a frat party. Oberlin has a reputation for attracting liberal do-gooders. Someone who is both conservative and irritated by liberals, or who doesn’t like defending his or her views, would not be very happy here. (However, a conservative who likes arguing would probably do fine. Little cadres of non-libertarians and Rush Limbaugh heads do exist.)

“Open-minded is the first adjective I can come up with. The biggest social event of the year is the Drag Ball (talk about learning experience—men trying to maneuver in high heels does more consciousness-raising than a weekend retreat with Gloria Steinem!) I don’t think there is any one Obie type. What happens is that somewhere in the years you spend here, you become yourself.”

“Oberlin is a place where creativity comes in all shapes and sizes and is valued over

obedience. The most important thing to be here is yourself. Come here wondering who that is, and leave with more questions, and maybe a bit of insight.”

“Someone who is inquisitive, culturally sensitive, critical of all they learn, and not content to fit a social mold. The person best suited to Oberlin is one who is a social misfit, and I say that with fondness, being one myself.”

### If You Had It to Do Over Again, Would You Go to Oberlin?

All but one reviewer enthusiastically said yes. The undecided voter felt that his major department was one of Oberlin’s weaker ones.

“Absolutely. Oberlin really helped me grow up and learn to think critically, an ability I will carry with me in everything I do. It strengthened my desire to be an active community member and helped me learn to balance all the activities that are important to me.”

“Absolutely! When I was looking at schools, I got all sorts of college view books promising that when I graduated from their college I would be this or that. Ready for a corporate job. Ready for law school. Ready to be some lofty thing, just like every other person who graduated from that college. Cookie cutters make me nervous. The impression I got from Oberlin (and what I can attest to, having spent four very interesting years there) was that when I left Oberlin, I would be myself. A stronger, clearer, better educated me. I certainly don’t feel like a finished product—I am very happy being a work in progress. But I am ready to be me in just about any situation I walk into. That is the most valuable education I can think of.” ■

**A**s you try to find the college or university best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.

*Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or IAAY.*

# THE COACH'S CORNER

by Zuming Feng

Zuming Feng earned his Ph.D. in mathematics from The Johns Hopkins University. A mathematics teacher at Phillips Exeter Academy, Mr. Feng coaches the school's math team for participation in the AHSME, AIME, ARML, and the Mandelbrot Competition. In the summer, he is an instructor at the USA Math Olympiad Summer Program, where he helps train the national team for the IMO.

## How to use area

The exercises in the last issue required you to solve problems by calculating area. Here, we continue our work with area, but with problems requiring proofs instead of solutions.

## Exercises

1. [Ceva's Theorem] Let  $ABC$  be a triangle and let  $D, E, F$  be points on the lines  $BC, CA, AB$  respectively. Prove that the lines  $AD, BE, CF$  are concurrent if and only if  $\frac{BD}{DC} \cdot \frac{CE}{EA} \cdot \frac{AF}{FB} = 1$ .
2. Let  $ABCD$  be a convex quadrilateral with area 4. Prove that one of  $[ABC], [BCD], [CDA], [DAB]$  is bigger than 1. (This problem appeared in the first round of the Chinese National High School Math Contest.)
3. Let  $ABCD$  be a quadrilateral with inscribed circle  $\omega$ . Let  $DEFG$  be the convex quadrilateral formed by the points of tangency. Prove that  $AC, BD, DF, EG$  are concurrent.

## Solutions to November/December Coach's Corner

Converting different shapes back to the most basic shape—the triangle—is the theme of the following exercises:

1. Connect  $AC$ , we obtain  $[ADF] = [AFC] = m$  and  $n - m = [AEC] = 2[ABE]$ . We have  $[ABCD] = m + n + \frac{n - m}{2} = \frac{3n + m}{2}$ .
2. Connect  $MC$ , we observe that  $[EMD] = [CMD]$ . We have  $[EBD] = [CMB] = [ABC]/2 = 12$ .
3. Let's work on a more general case. Let  $[ABP] = a$  and  $[CDP] = b$ .  
We have  $[ABC] = [ABD]$  and  $[ADP] = [ADB] - [ABP] = [ABC] - [ABP] = [BPC]$ .  
Since  $\triangle ABP \sim \triangle CDP$ , we have  $AB : CD = AP : PC = BP : DP = \sqrt{a} : \sqrt{b}$ .  
We observe that  $[ABP] : [BCP] = AP : PC$ . Thus  $[BCP] = \frac{a\sqrt{b}}{\sqrt{a}} = \sqrt{ab}$ , which is the geometric mean of  $[ABP]$  and  $[CDP]$ .
4. Extend  $BA$  and  $CD$  to meet at  $P$ . Let  $EF = x$ ,  $[ABCD] = 2a$ , and  $[ADP] = b$ .  
We have  $\left(\frac{x}{7}\right)^2 = \frac{a+b}{b} = 1 + \frac{a}{b}$  and  $\left(\frac{17}{7}\right)^2 = \frac{2a+b}{b} = 2 + \frac{a}{b}$ , which implies that  $\frac{a}{b} = \frac{120}{49}$  and  $x = 13$ .

Note: Here we choose  $\left(\frac{x}{7}\right)^2 = \frac{a+b}{b}$  instead of  $\left(\frac{7}{x}\right)^2 = \frac{b}{a+b}$  to make our calculation much easier.

Can you explain why? —Making the denominator of an algebraic fraction simpler ( $\frac{a+b}{b}$  in this case) is very helpful in most situations.



# ImaGiNe...

## LOOKING AT AN ELEPHANT

by Deborah Lauren Brown

Look at the elephant with  
his huge tusks and trunk—  
evolved over cons  
into this curious hunk.

Mutations favoring survival  
passed down to our age  
while others came and went  
at an earlier stage.

You see the trunk and ask why.  
The answer is nature: Adapt or die.  
The longer nose means  
more food to eat  
than the shorter-nosed brethren  
walking the same beat.

Genes for long noses  
gradually began to rule,  
eventually taking over  
the elephant pool.

Look at an elephant  
and what do you see?  
Sixty million years  
of natural history. ■



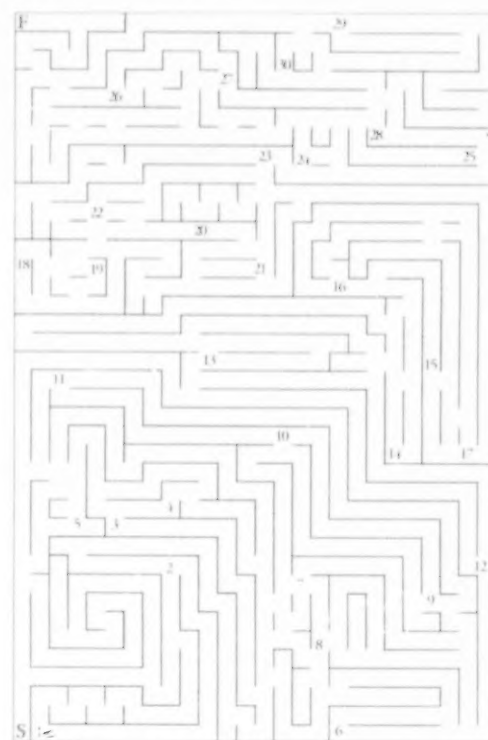
Deborah Lauren Brown is the ninth grade at New Rochelle High School in New York. She wrote this poem for her biology class as part of a homework assignment on evolution.

### YOUR WRITING COULD BE ON THIS PAGE!

We welcome submissions of poetry, short stories, essays, book reviews, and puzzles. Please write to *Imagine* ■ SET at IAAY ■ The Johns Hopkins University ■ Baltimore, MD 21218

## MAZE

by Edward Shen



### RULES:

- Starting at S, follow the numbers in order and end at F.
- Line may not intersect itself.
- Line may not pass twice between the same walls.

Edward Shen is a sophomore at El Toro High School in Lake Forest, CA, where he is active in Key Club, FBLA, SEA, Academic Decathlon, and Mock Trial. In addition to creating puzzles, he is also interested in math and computers.



# ImaGiNe...

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with these registration deadlines for selected academic competitions.

*Inquire about competition format, dates, and fees.*

## DEADLINE COMPETITION

- February 3** **Toshiba/NSTA ExploraVision Awards Program**—Teachers and community advisors register student teams, grades K-3, 4-6, 7-9, 10-12: Toshiba/NSTA ExploraVision Awards, 1840 Wilson Boulevard, Arlington, VA 22201-3000; (800) EXPLOR-9; [www.nsta.org/programs/explora.htm](http://www.nsta.org/programs/explora.htm)
- February 5** **Quill & Scroll Society International Writing and Photography Contest**—Individuals enter, grades 9-12: School of Journalism, University of Iowa, Iowa City, IA 52242; (319) 335-5795, fax (319) 335-5210.
- Spring & Fall** **Ralph Waldo Emerson Prize**—Students submit history essays to *The Concord Review*; authors of published essays are eligible for one of three \$3,000 prizes; grades 9-12: Dr. William Fitzhugh, The Concord Review, PO Box 661, Concord, MA 01742; (800) 331-5007; [www.tcr.org](http://www.tcr.org)
- March 3-9** **USA Computing Olympiad Spring Open**—School coordinators register entrants in grades 9-12. Three Internet competitions: November, January, and March. National championship in April. Send an e-mail to register: Dr. Donald T. Piele, University of Wisconsin-Parkside, Kenosha, WI 53141; (414)595-2231; [piele@cs.uwp.edu](mailto:piele@cs.uwp.edu); [usaco.uwp.edu](http://usaco.uwp.edu)

## DEADLINE COMPETITION

- March 31** **NASA Ames Research Center Annual Space Settlement Contest**—Individuals through entire classrooms in grades 6-12 can enter. Students develop space settlement designs. Entry forms available on-line: Al Globus, MS T27A-1, NASA Ames Research Center, Moffett Field, CA 94035; [science.nas.nasa.gov/Services/Education/SpaceSettlement/Contest/](http://science.nas.nasa.gov/Services/Education/SpaceSettlement/Contest/)
- April 21** **Knowledge Master Open**—Schools enter one team each for middle, junior high, and high school divisions: Academic Hallmarks, Box 998, Durango, CO 81302; (800) 321-9218 or (970) 247-8738; fax (970) 247-0997; [www.greatauk.com](http://www.greatauk.com)
- May 1** **American Regions Math League (ARML)**—Teams register for national competitions held at Penn State and Universities of Iowa and Nevada; grades 7-12: Mark Saul, ARML President, 711 Amsterdam Avenue, New York, NY 10025; (212) 666-5188.
- June** **USA Mathematical Talent Search (USAMTS)**—Individuals enter for 1999-2000 school year (collaboration between the Consortium for Mathematics and its Applications and the National Security Agency): Annette Moccia, COMAP, Inc., Suite 210, 57 Bedford Street, Lexington, MA 02173; (800) 772-6627 x29.

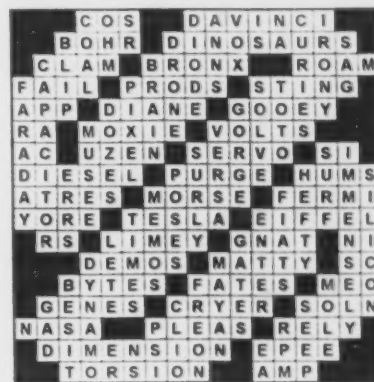
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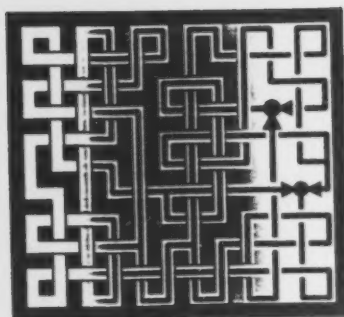
### Solution to Word Wise



More about...  
*Faraday*

The man who transformed electricity from a scientific curiosity into a useable force was not an engineer. When Michael Faraday was 14, his father, a blacksmith, apprenticed him to a bookbinder.

During those seven years, Faraday taught himself about science by reading and attending public lectures. At 21, Faraday sought a second apprenticeship—with one of the most famous chemists of the day—and went on to become one of the greatest experimental scientists in history.



# Knossos Games

by Tim Boester

A first-year graduate student in mathematics at the University of Wisconsin.

Tim Boester now has additional puzzles on his home page.

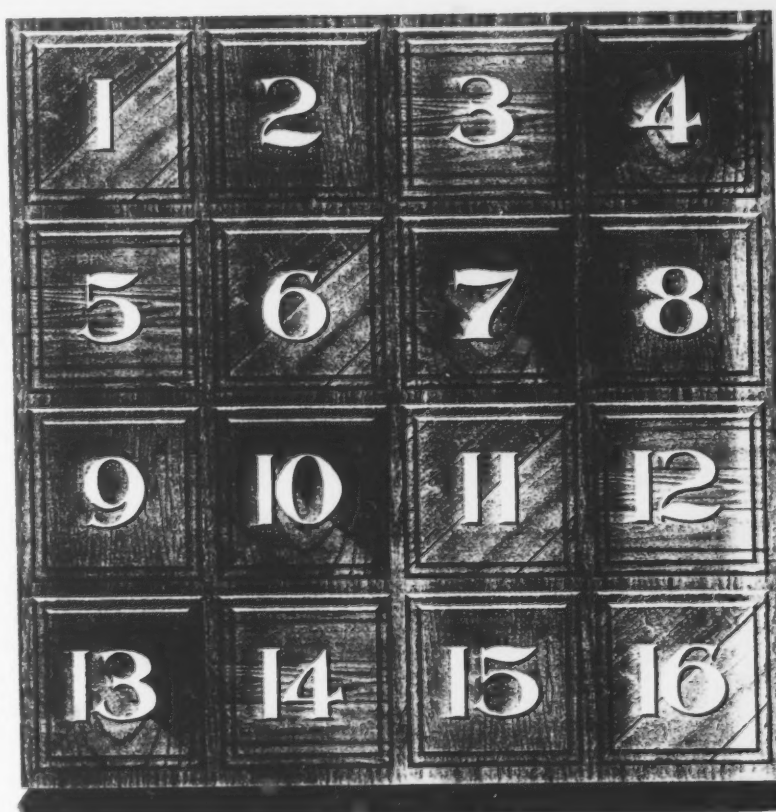
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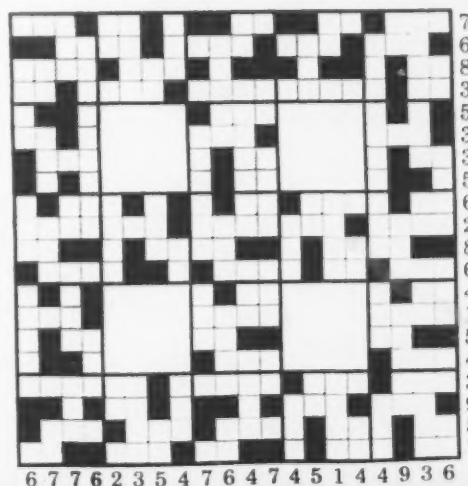
## Directions:

As a collector of rare coins, you have a special cabinet with sixteen numbered compartments, each of which holds the number of coins shown on the label. At least, you did until someone mixed up your coins. Now, *no* compartment contains the number of coins shown on the label. From the following clues, can you figure out the new arrangement?

- The compartment that now holds three coins lies directly above the one that now holds sixteen coins.
- The new number of coins in one compartment is the square of the old number, and that compartment lies directly above one that now has twice as many coins as it did before.
- The compartment that now has two coins is not in the left-most column.
- One compartment, which now has half as many coins as it did before, lies directly below a compartment that now has twice as many coins as it did before and directly above a compartment that now has one less coin than it did before.
- The compartment that now holds thirteen coins lies directly to the right of the one that now holds fifteen coins.
- Moving along one of the diagonals: one compartment now has nine fewer coins than it had before, the next has ten fewer than before, the next has twice as many as before, and the last has nine more than it had before.
- The compartment that now holds six coins lies directly below the one that used to hold six coins.



Solution to Knossos Games in our November-December issue:



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98



VOLUME 6 • NUMBER 4

# Imagine...

Opportunities and Resources for Academically Talented Youth

March/April 1999

## SPOTLIGHT ON CROSS-CULTURAL STUDIES

Bridging the Language Gap

Becoming Slovakian

Improving Lives Through Physical Therapy

Students Review Case Western Reserve University

*Imagine is a publication of  
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## Focus On: Cross-Cultural Studies

WE INHABIT A SHRINKING WORLD. WE CROSS OCEANS AND CONTINENTS, journeys that once took months to complete, in a few hours by plane. We can speak to friends in Berlin or Tokyo by picking up the phone, or send messages all over the globe just by clicking a button on our e-mail.

We explore other cultures for many reasons. Perhaps we make a friend from another country, or become intrigued by traditions that seem fresh and exotic. We may be curious about political changes in a particular region of the world. Or we may read about poverty and abuse across the ocean and simply decide to help.

In this issue of *Imagine*, you'll read about people who have reached out to another culture. Some look to the past for inspiration; others are working to build a better future. All know the personal growth that comes with opening our minds and hearts to new people, new landscapes, new ideas.

Each of us plays a role in the global society. By experiencing other cultures, you can make your role a powerful one. No matter what your age, you can make connections that lead to mutual understanding. You can start today, and our writers will show you how.

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*Imagine...*

Opportunities and Resources for Academically  
Talented Youth\*

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On the cover:  
At Mori no Ike, the Japanese village at Concordia  
Language Villages, a student practices Taiko,  
traditional Japanese drumming.

Photo courtesy of Concordia Language Villages.

For more information about CIV, see pages 6-7.

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# Why Learn a Foreign Language?

by Diane Clavier

ONCE HAD THE DUBIOUS PLEASURE of teaching French to 27 incoming college freshmen. It was my first time in the classroom, and I entered the course full of academic pearls that I could hardly wait to cast before them. I loved studying languages—the texture of unfamiliar sounds, the rhythms and idioms, both quaint and seductive, unique to every language ever spoken. I wanted to share this passion with them. But after the first few weeks, I fell out of my cloud with a resounding thud. My students were bright, fun, polite, and completely apathetic towards French.

Why would these intelligent young men and women pass on the chance to learn a new language? Probably because they didn't see the point. After all, America is an English-speaking country. For that matter, so is most of Canada. So why bother?

## Crossing Divides at Home and Abroad

The truth is, American citizens speak everything from Italian to Japanese in their homes. And taking the time to bridge the language gaps in your own community can really be worthwhile. One of the closest friends I have ever had could barely speak English. Her husband is an American citizen and she a permanent resident. I was her English tutor. As I guided her through the vagaries of English usage, I longed to solve the mystery behind the velvety consonants and elliptical vowels of her native Polish. Soon she became my teacher, beaming as I pronounced the sounds that reminded her of the home she'd left behind. Through efforts on both sides, we managed to converse for hours about all of the things closest to our hearts.

While my friend left her home to live permanently in a new country, many of us travel only temporarily to foreign lands. But without a working knowledge of the language, visiting a new country can be a bit like watching a movie with the sound

turned off. We can certainly marvel at Mont Blanc or the Sistine Chapel without knowing French or Italian, but surely we'll have missed something. A place is more than a collection of monuments and natural wonders. And only by talking to the people can we begin to perceive the culture that gives the land its unique character. Moreover, really listening to others can lead to the liberating sensation of stepping outside of our own cultural biases and seeing the world as others see it.

## Beyond Speech

Perhaps even better than speech, the written word reveals how each culture (including our own) defines itself. When we study the language of another country, we dig into its history and literary traditions, as well—and even familiar events and stories take on new meaning. Approaching history along unfamiliar paths, we discover new events and perspectives that add pieces to the jigsaw of the human drama. Seen from the viewpoint of occupied France, for example, World War II looks quite different than it does to those of us who avoided the tyranny of foreign rule.

Stories add another dimension to cultural identity and can best be understood within the context of a nation's literary traditions. To us, *Romeo and Juliet* seems tragic, but when viewed from the more satirical French literary aesthetic, the story begins to look comical. Each language gives rise not only to its own stories, but also to unique means of expression, of making beautiful phrases. What is graceful and logical in one language may fall flat in another. Rendering the rage of Achilles poetically in English requires some changes in meaning. We can have accuracy or beauty. We cannot have both. That is why translation is a delicate art. When we delve into literature in other languages, we expand our aesthetic sensibilities and—because each language defines them differently—what we mean by “drama,” “poetry,” or “story.”

## Re-Learning English

But even before achieving the proficiency to read *Madame Bovary* or *The Brothers Karamazov* in the original, you will begin to learn things about your own language. You will begin to see that it offers one possibility among many for naming and categorizing things and ideas. Each language is capable of expressing things that the others cannot. For example, we cannot translate “I’m confused” into French. Conversely, the English word “love” is woefully inadequate in comparison to Greek’s *eros* (romantic love), *phelos* (friendly love), and *agape* (selfless love). English, with its enormous lexicon, cannot really find words to translate German ideas like *gemütlich* (what we might say of a room arranged perfectly for tranquility and contemplation) and *realpolitik* (political maneuvers for a specific interest or purpose)—so we usually just borrow the words instead.

When we speak only one language, we set limits not only on our ability to communicate, but on our very thoughts and ideas. We think and speak in terms of an arbitrary set of sounds and symbols that our linguistic forefathers agreed upon. Within each language, this set is necessarily finite, and our expression is bound inextricably to its limitations. And each set includes possibilities that the others lack. So each time we learn a language, we reduce the constraints on our thought and expression.

How many times have you had the germ of an idea that was just beyond your ability to clearly think through—that frustrating sense that “I know what I mean, I just don’t know how to say it”? This is because the human spirit is larger than any one language. That is why the human race has created such a wide variety of languages and ideas. As Walt Whitman might have said, we contain multitudes. Learning another language can help you explore not only Paris or Buenos Aires, but also the undiscovered lands inside you.



*"A plurality of languages  
and societies—each language  
is a view of the world, each  
fiction is a world."  
—Octavio Paz*

WHY STUDY a "dead" language and the culture of a long-gone civilization like Rome? Because it shows us a different way of seeing the world, opens our eyes to the complexity and beauty of culture, and allows us to view Western culture in the light of its historical roots.

Classics focuses on the ancient Mediterranean world: its history, its languages, and its legacy of literature, art, and philosophy. The epics and mythology of Greece and Rome have fascinated countless generations of children and adults alike. But before I began to study Latin, the ancients did not appeal to me. Latin and Greek, despite the famous literature and philosophy they offered, seemed like dead languages of only scholarly interest. I began studying Latin primarily to improve my SAT scores and my understanding of modern literature.

Since then I have taken three and a half years of Latin classes and spent a summer at the Governor's Latin Academy at Hollins University in Roanoke, Virginia. Now I understand far better why, for centuries, scholars and thinkers have turned to the ancients and sought to know their thoughts and history and to appreciate their art. Those who study the ancient Mediterranean world find a wealth of issues and ideas to absorb and evaluate. In a few short years, I have learned a lot about ancient literature, art, and philosophy. But I have seen merely a fragment of the whole.

### *The Weight of History*

Because the study of Latin and classical Greek focuses more on reading than on verbal communication, students begin to read authentic texts early on. I, like most students, began with Latin prose, which focuses on history and politics. The first original text I read was *De Bello Gallico* (*On the Gallic War*), Julius Caesar's fascinating account of how he conquered Gaul (modern-day France) from 58 to 50 B.C. He describes not only his armies and battles, but also Gaul, Britain, and the Germanic and Celtic peoples and cultures he encountered. As I read the work of this powerful figure,



Roman history took on a new significance. Caesar's conquests shaped Europe by determining the borders of Germany, France, and Britain. Rome's subsequent occupation of Europe determined the course of Western culture by spreading the Latin language, Greco-Roman thought, and, eventually, Christianity throughout Europe.

If Caesar shows the force of history, his contemporary, the historian Livy, shows its more imaginative side. Intertwining mythology and reality, Livy glorifies Roman history. His narrative begins with Aeneas (a Trojan warrior and hero of Virgil's epic *The Aeneid*) and Rome's mythical foundation by Romulus, who, though son of the god Mars and a Vestal Virgin, was suckled by a wolf. The history grows more factual as it chronicles the Roman kings and the creation of the Republic, the apex of Roman history, for it was under the Republic, not the Caesars, that Rome built one of the world's greatest empires.

Roman history is also preserved in letters and orations. Some of the most famous of these were written by Cicero, a statesman, philosopher, and master stylist who fully developed the poetic and prose devices of Latin and became the model for many European writers. Macaulay, an English author and orator, once wrote, "Cicero taught Europe how to write." While studying the Catalinarian orations (in which Cicero denounces Cataline and a conspiracy to destroy the Republic), I found their linguistic complexity daunting. But the influence that Cicero's ornate prose has had on English literature makes it worth struggling through.

### *Forma Poetica*

Latin's combination of complexity and flexibility graces Roman poetry, which is utterly unlike English verse. The meter (the rhythmic structure) of Latin uses patterns

# How I GOT HOOKED ON CLASSICS

*by Owen Gwilliam*



not of stressed and unstressed syllables but of long and short syllables. This "quantitative verse" provides a rigid structure for the poet to work within, allowing him to create verses of tranquil stateliness that contrast with their livelier English counterparts.

Many Latin sentences have a puzzle-like complexity that requires precise analysis. To catch all of its meaning, one must read Latin poetry slowly; but this does not diminish its beauty. As Nietzsche, a German philosopher and expert on Greek drama once wrote, the comprehensive study of literature "teaches [us] to read well, ... slowly, deeply, looking cautiously before and aft, with reservation, with doors left open, with delicate eyes and fingers."

As I became experienced with poetry, I learned to enjoy its subtler pleasures: tension between the expected rhythm (ictus) and the chosen rhythm (accent); the interplay of sound and meaning; and the vagaries of pronunciation. I have also learned to enjoy, rather than be frustrated by, the possibilities for interpretation that depend not only on the words themselves, but on how they are pronounced and where they are placed. For instance, in Book I of *The Aeneid*, Virgil writes that Aeneas "premit alium corde dolorem" ("presses the deep sorrow into his heart"). The words "deep" and "sorrow" surround the word "heart" to emphasize how great his sorrow is; it surrounds his heart, overwhelms him. And because little tags at the ends of words, rather than placement in the sentence, determine grammatical meaning in Latin, Virgil's word order—"he presses deep into his heart the sorrow"—is perfectly correct.

But the elegance of Latin verse would not be complete without the stories it tells. Much of Latin poetry focuses on timeless

human concerns like courage, love, rage, and despair. Virgil's *Aeneid*, for example, transcends its Roman context and speaks to the modern reader. The warrior Aeneas has lost all he loves in the Trojan War but has been saved by the gods to found a second Troy, a city destined to rule the world: Rome. Though overwhelmed with sorrow, Aeneas faces his fate and the trials of his ten-year journey to Italy because he is "insignis pietate"—marked by goodness. Aeneas's courage and strength in the face of adversity are admirable in any age; and Virgil's mastery of Latin verse enhances the power of this enduring legend, which, like the epics of Homer, never seems to go out of fashion.

Of the Latin poets I have studied—Catullus, Ovid, and Virgil—my favorite is Ovid. Born just after Julius Caesar's death, Ovid was one of the three greatest writers of his time, along with Virgil and Horace, and has influenced many future authors from Shakespeare to Ted Hughes. Most students study *Metamorphoses*, a series of vignettes about mythical characters like Narcissus or Echo, many of whom meet with tragedy but avoid destruction by metamorphosing into a part of nature. Some sections are merely charming, but others, like the story of Daedalus and Icarus, resonate deeply. Imprisoned on Crete and "touched by love for his homeland," Daedalus creates waxen wings so that he and his young son Icarus can fly home to Athens. Icarus, heedless of his father's warnings, flies higher and higher until the sun melts the wax and he falls into the sea. His father frantically calls for him, then spies the wings upon the waves. Daedalus, cursing his talent, builds a tomb for Icarus. This story of fate overcoming human ingenuity is so powerful that James Joyce even named the hero of *A Portrait of the Artist as a Young Man* after Daedalus.

## The Cradle of Western Thought

But great literature is only a small part of classics. Latin and Greek are also windows into the origins of Western philosophy. Socrates, an Athenian, initiated ethics with his questions about the nature of justice and goodness. Plato, his pupil, and Aristotle, Plato's student, expounded philosophical systems that have dominated Western thought for over 2,000 years.

The study of ancient philosophy leads to a variety of historical traditions. The first



Colosseum

Greek philosophers, the real ground-breakers of Western thought, struggled to explain the physical nature of the universe and the moral and intellectual nature of man—using deductive reasoning to derive complex conclusions from simple assertions. Aristotle's philosophy treats everything from physics to ethics to metaphysics. The Romans produced little original thought, but clarified and systematized what they learned from the Greeks. Early Christian church "fathers" such as Augustine synthesized the Greek intellectual heritage with the ancient Hebrew teachings about God and the purpose of history. At the Latin Academy, we argued Augustine's ideas with the most engagement, for they touched our own beliefs. But all of these readings and discourses have been equally vital parts of my education, laying the groundwork for a deeper understanding of Western thought.

So why study classics? Not merely for the derivative benefits of higher SAT scores or familiarity with literary and historical allusions, but also because the ancients were living people whose language, action, and art have a vitality, beauty, and permanence that transcend time and speak of our common humanity. ☪

A junior in the International Baccalaureate program at Robinson Secondary School in Fairfax, VA, Owen Gwilliam finds time for

sports, math, music, and poetry when he's not reading one of Ovid's latest. As his friend Tony once said, "If studying classics is cool, consider him Miles Davis."



Arch of Constantine

"**W**IE HEIßT DU?" asked the young woman across the table. I could feel my ears turning red. What was this lady saying? And how was I going to figure it out? "Ich heiße Gretel," she said, pointing at a wooden medallion hanging from her neck. "Wie heißt du?" pointing at me. Suddenly, I got it. "Anna!" I replied proudly. She had told me her name and asked for my name in German, and I had understood.

So started my experience at Waldsee, the Concordia College German Language Village just outside Bemidji, Minnesota. I was seven years old, and my parents had decided that it would be good for me to learn German because we have relatives in Austria. So that summer I found myself smack dab in what felt like a whole different country, even though I hadn't left Minnesota.

### No English Allowed

When I first arrived at Waldsee, I had to pass through "customs," where officials searched my bags to make sure I wasn't sneaking in any English tapes, CDs, books, or magazines. Then, after receiving my passport, I was allowed to pick a new name to be known by while at camp. The first year I chose "Lisa," the name of one of my Austrian relatives.

Every day at Waldsee, I could speak a little more German than I could the day before. The counselors always spoke in German, so we were exposed to the language all day, every day, whether playing volleyball, doing activities during small group time, or getting money (Deutsche marks) from the bank to buy candy. Sometimes it was frustrating when I couldn't understand what the counselors were saying and all they did was repeat the same words over and over, gesturing like crazy. But nothing could beat the pride I felt when I finally understood, all by myself. Watching German videos (including Monty Python's *The Holy Grail* in German!), playing German board games, and listening to CDs of German bands improved my comprehension of the language even more. By the end of each day, my head was filled with German songs.

## AN AMERICAN IN "GERMANY"

### Five Summers

### of Language Immersion

by Anna Moschet

### Different Times. Different Cultures

For the next four summers I attended camp at Waldsee, and each year my ability to speak and write German improved. I tried new activities every summer, like waitressing at the Waldsee Café, acting in a play, and learning traditional German dances.



*The Fairy Tale Forest, a drama activity for villagers, is one programming option at Waldsee.*

And Waldsee's variety of programs makes it difficult even for campers who return year after year to become bored. In addition to regular camp activities like swimming and canoeing and other sports, you can learn about the environment and how to live in the woods, or you can help write and produce a play, all in German.

My favorite program at Waldsee is called "Maerlinwald," which was designed specifically for campers who have been to Waldsee a number of times. In Maerlinwald, we went by medieval German names and met at a secret spot in the forest. No one else, not even the other counselors, knew where it was. There we made art projects, attended medieval banquets, and (my favorite) wrote a play based on a medieval German folktale. We even got to perform the play for the deans of nearby villages.

Though we spent most of our time immersed in German language and culture, we also got a glimpse of life in many other countries on International Day. Campers from all of the other language villages visited Waldsee for this full day of music, food, and fun. I had a great time seeing all the costumes, hearing the songs and sayings, and tasting a variety of foods from countries like France, Norway, China, Japan, Finland, Russia, and many more. Some villages even brought art projects for others to do. International Day helped make me aware of how many different cultures there are in the world and how special each one is.

### Making Connections

After my fifth summer at Waldsee, I visited my relatives in Austria. I was amazed at how much I had learned and how easy it was to put into practice. And my relatives were amazed at how much German I knew. In fact, my parents often asked me to translate for them.

I never could have learned so much about a language and a country just by sitting in a classroom. But by leaving my American self behind for a few weeks each summer, I could begin to see the world differently. My experience at Waldsee German Language camp gave me a sense of connection not only with my relatives, but also with a whole other part of the world. ☺

Anna Moschet studies German and pursues her interest in the theater arts at Minnetonka High School in Minnesota. Anna has visited Germany and Austria twice and hopes to go back very soon.

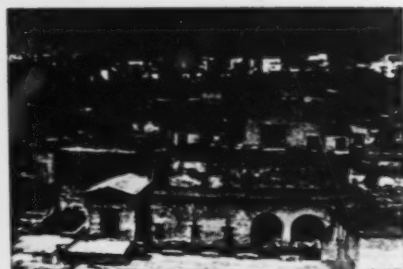


See facing page for contact information for Concordia Language Villages.

# Explore a New Culture

Imagine attending a year of high school in Brazil or embarking on a tour of the Mediterranean. High school students now have several options for cultural discovery.

Many of these programs are selective, so we recommend that you apply early. Be sure to inquire about qualification requirements, application procedures, deadlines, fees, and scholarship availability.



HARVARD/STOUT

## Study Abroad/Cultural Exchange

### American Field Service

For information about AFS, see page 18.

### ASPECT Foundation Outbound Program

Semester and school-year homestay programs. Ages 15-18.

Aspect Foundation, 350 Sansome Street, Suite 900, San Francisco, CA 94104; (415) 228-8050, (800) 879-6884, fax (415) 228-8051; [www.aspectworld.com](http://www.aspectworld.com)

### AYUSA Study Abroad

Semester, school-year, and summer homestay programs. Ages 15-18.

AYUSA International, One Post Street, 7th Floor, San Francisco, CA 94104; (888) 552-9872, fax (415) 986-4620; [www.ayusa.org](http://www.ayusa.org)

### CCI Discovery Abroad Programs

Semester and school-year homestays, ages 15-18; 3-4 week language travel, ages 14 and up; international summer youth camps, ages 10-17.

Center for Cultural Interchange, 17 North Second Avenue, St. Charles, IL 60174; (888) ABROAD1, (630) 377-2272, fax (630) 377-2307; [info@cci-exchange.com](mailto:info@cci-exchange.com); [www.cci-exchange.com](http://www.cci-exchange.com)

### CTYI, Dublin

3 week residential summer program. Ages 12-16.

The Irish Centre for Talented Youth, Dublin City University, Dublin 9, Ireland; 353-1-7045634, fax 353-1-7045693

### EF High School Year Program

School-year homestays with optional discovery tours; two-week language and culture camps. Ages 15-18.

EF Center, 1 Education Street, Cambridge, MA 02141; (617) 619-1420; [www.ef.com](http://www.ef.com)

### People to People Student Ambassadors

2-3 week summertime group visits with adult leader. Grades 6-12.

People to People, Dwight D. Eisenhower Building, 110 S. Ferrall Street, Spokane, WA 99202-4800; (509) 534-0430, fax (509) 534-5245; [info@studentambassadors.org](mailto:info@studentambassadors.org); [www.studentambassadors.org](http://www.studentambassadors.org)

### Youth for Understanding

Semester, school-year, and summer programs. Ages 15-18.

YFU International Center, 3501 Newark Street, N.W., Washington, DC 20016-3199; (202) 966-6800, (800) TEENAGE, fax (202) 895-1104; [pio@us.yfu.org](mailto:pio@us.yfu.org); [www.yfu.org](http://www.yfu.org)

## Travel Abroad

### Adventure Ireland

1-3 week summer programs, including homestays, culture, and adventure.

Adventure Ireland, Ashfield College, Templeogue, Dublin 6W, Ireland; 353-1-4900246, fax 353-1-4900246; [info@adventure-ireland.com](mailto:info@adventure-ireland.com); [www.adventure-ireland.com](http://www.adventure-ireland.com)



### American Council for International Studies

Teacher/student group travel tours; college-style summer study abroad for juniors and seniors.

(800) 888-ACIS; [edu\\_travel@acis.com](mailto:edu_travel@acis.com); [www.acis.com](http://www.acis.com)

### Cultural Heritage Alliance

Fully planned teacher/student travel packages.

(800) 323-4466; [www.cha-tours.com](http://www.cha-tours.com)

## Language Immersion

### Concordia Language Villages

A variety of language immersion programs in the United States and abroad. Ages 7 and up.

Concordia Language Villages, 901 8th St., S. Moorhead, MN 56562; (800) 222-4750, (218) 299-4544, fax (218) 299-3807; [clvoffice@cord.edu](mailto:clvoffice@cord.edu); [www.cord.edu/dept/clv](http://www.cord.edu/dept/clv)

### Organization for Cultural Exchange Among Nations

Internationally based summer language programs. Ages 15-18.

OCEAN, 2101 E. Broadway Road, Suite 2, Tempe, AZ 85282-1735; (800) 286-2326, fax (602) 784-4891; [ocean.intl@worldnet.att.net](mailto:ocean.intl@worldnet.att.net); [www.oceanintl.org](http://www.oceanintl.org)

## Additional Resources

### Advisory List of International Educational Travel & Exchange Programs (\$15.00)

Council on Standards for International Education Travel, 212 S. Henry Street, Alexandria, VA 22314; (703) 739-9050, fax (703) 739-9035.

### International Exchange Locator (\$29.95)

Alliance for International Educational and Cultural Exchange, 1776 Massachusetts Avenue, Suite 620, Washington, DC 20036; (202) 293-6141, fax (202) 293-6144.

### A World of Options for the 1990s: Guide to International Educational Exchange, Community Service, and Travel for Persons with Disabilities.

Mobility International USA, P.O. Box 10767, Eugene, OR 97440; (541) 343-1284, fax (541) 343-6812; [miusa@igc.apc.org](mailto:miusa@igc.apc.org)



# HANDS ACROSS THE WATER:

## The Traditional Cultural Sculptures of Ray Chen

by Lesley Mackay

*Clay—fine-grained earthen material or sticky soil, made up of rock that has been pushed to the earth's surface and aged and battered by weather.*

A SMOOTH, MALE HAND and a gritty wedge of American clay ... a mother and son separated by the world's largest ocean ... the artistic disciplines of East and West ... memories of a Taiwanese childhood and present-day life in the U.S. From these divergent elements, Ray Chen creates unusual, beautiful, and, above all, expressive sculptural forms.

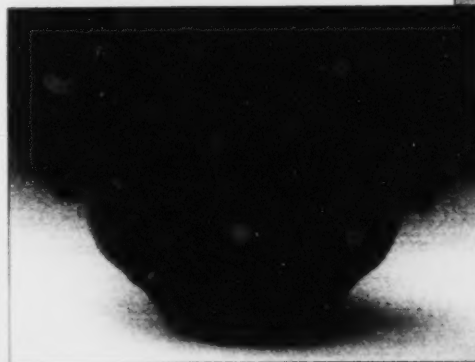
Born in Taipei, Ray spent his youth immersed in art. At home, his mother instructed him in the Japanese-inspired discipline of formal Eastern flower arrangement—an unusual area of study for a Taiwanese male. In school and, later, at Taiwan University, Ray studied classical Western music, becoming an accomplished choral singer and violinist.

After college, he expected to spend his life making recordings of Western classical music. But this plan was complicated by a passion for another art form—drawing. Since early childhood, he had loved sketching. "After college," he says, "I realized I liked creating my own sketches more than playing music others had composed."

In search of his creative destiny, and a way to make a living, Ray began to think about other avenues in the visual arts. Setting music aside, he began to study pottery at a neighborhood studio in Taipei, where he slowly mastered the basics of ceramics.

### From Traditional Eastern Forms

Curved slightly over a potter's wheel at Baltimore's Clayworks, where he is currently a resident artist, Ray describes the beginnings of his odyssey into the world of clay. "It took me six months to learn to throw a single pot," he says ruefully. Like all newcomers to the wheel, he grappled with the tough, yet delicate, process of centering a slippery, spinning clay mound.



smoothing its surface, and opening it up into a shapely vessel.

He also began an intensive study of hand-building techniques. In hand-building, pots are created from slabs (clay is rolled out with a rolling pin or sliced with a wire or tossed into sheets) or from coils (clay is layered in long, snake-like ropes that are left visible or smoothed over). Sculpture is advanced, freeform hand-building. The unstructured process of sculpting, as well as the abstract nature of contemporary sculptural forms, called to Ray Chen.



Uniformity and smoothness characterize Ray's traditional pottery.

But he had embarked on a long, traditional apprenticeship—four years at his neighborhood studio followed by three more with one of his teachers, an expert in the pottery of the ancient Chinese dynasties. With this teacher and two other potters, Ray took on an unusual, idealistic project: they threw large quantities of traditional Chinese pots and sold them at the same price as factory-made pots. The team's intention was to offer ordinary Taiwanese consumers a household full of individually created replicas of historic ceramic pieces.

The project did not succeed financially. "We weren't able to throw enough pots to make a profit," Ray says. "But the forms



were beautiful, and I learned a lot about classical Chinese aesthetics." Those aesthetics, he explains, emphasize uniformity and smoothness of line and texture.

## to a Western Expressiveness

Ray gets up from his wheel and walks to the sunny, open gallery where his latest exhibition, entitled *Mother and Child*, is mounted. The contrast between the smooth, flowing pots he has just described and this asymmetrical work could not be more dramatic. The pieces bring to mind ancient, barnacled sea-creatures. Each sculpture features two massive, strangely shaped, highly textured, and beautifully colored forms propping each other up, flowing into each other, or simply lying side-by-side. While the forms are abstract, Ray explains that the larger piece in each pair signifies the mother.

How did the artist who had thrown hundreds of perfect, identical bowls come to create such forms? By setting aside the ceramic techniques he had learned with such devotion. Ray created each sculpture in miniature with a tiny amount of clay. Then he found ways to realize the form on an outsize scale. "That part is difficult," he says. "Every material, including clay, has its limitations." What works on a scale of centimeters can easily fall apart when re-scaled in meters. "But once I decide on a form," Ray says, "I find a way to make it viable in the scale I want."

The sculptures in *Mother and Child* took shape on the pottery wheel; but their strange beauty comes from the bending, twisting, battering, and roughening Ray inflicted on them afterward and from the cracking and the peeling of the low-temperature glazes he purposefully chose. In their devolution away from any kind of perfection, the sculptures became both less and more than ideal forms: they became expressions of Ray's inner world. Looking at his



In the sculptures in his exhibition *Mother and Child*, Ray used techniques he refined in the West to express Eastern ideals.

mounted pieces, he says, "I am happy I have found a way to express my feelings."

## Objects in Space

The *Mother and Child* dyads are all installations. In this complex kind of sculpture, two or more pieces are presented together, the spatial arrangement among them contributing to their beauty and significance. Ray studied installations in his last apprenticeship in Taiwan: a three-year period with the renowned Taiwanese artist Margaret Sui Tan. "I left the studio where I had been making traditional Chinese pots to create white porcelain, paper-thin sculptures for Ms. Sui

Tan's installations. I made the pieces from slabs, and she altered the shapes."

The image of clusters of white, paper-thin, porcelain sculptures evokes a spray of orchids, bringing to mind the art of flower arrangement Ray learned years before. "I think that flower arrangement influenced me a lot," he says. "My mother taught me to think about the formal qualities of objects and how they might exist together in space."

## New Life. New Art

After his work with Ms. Sui Tan, Ray applied for, and won, an opportunity to teach ceramics at Ohio University, where he would earn a second Bachelor of Fine Arts degree, in ceramics, and concentrate on sculpture. He finished his formal studies with graduate work at the Rochester Institute of Technology before, in 1997, accepting a teaching fellowship and then his current position in Baltimore.

"It's been a long journey," Ray says. "Actually immigrating has been an important part of it. I feel each piece of work I do now expresses my affinity for both East and West. In this exhibit, the Eastern ideals of tradition and permanence within the family are conveyed through an expressiveness I have achieved here in the U.S."

Ray's muse remains in the Orient, where, for nine years, she has suffered from Parkinson's disease. "I am the only son in my family," he says. "I must take care of

my parents no matter what happens. But, for now, I am exploring questions of family mostly through my art."

And so Ray Chen has no plans to depart the United States. He enjoys the "creative atmosphere" he finds in this country. And, in the U.S., you can get better stuff. "Ceramic materials are more diverse in America," he says, standing among his sculptures, looking down at his white-stained hands. "I have more choices. I can get different porcelains and glazes that harden at different temperatures. I can get many textures of clay." ☞

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ANYONE who knows children knows the way they announce most seriously their intention of growing up to be a fireman, or a doctor, or a teacher, or president of the world. I, too, made a life decision at the age of five, but mine was rather unusual. I didn't decide I wanted to be a policewoman or the pretzel vendor on the street corner. I decided I wanted to be Jewish.

### First Steps

Born to an Episcopal mother who had left observant religion behind and a "culturally Jewish" father whose parents had renounced Judaism, I was nothing, neither Christian nor Jewish. I wanted the secure religious identity I saw in everyone else in our overwhelmingly Christian Connecticut town, and the abundance of both Jewish and Christian holidays we celebrated couldn't satisfy that desire. But I did not want Christianity. I preferred Judaism, which was alluring, exotic, Different. And also, as I discovered when I got older, impractical: the only synagogue was a half-hour away and the only option for bat mitzvah study, Hebrew school, expensive and rigidly defined.

When I was 12 years old, we moved to Cambridge, Massachusetts, where all the means for being Jewish—a synagogue, a tutor, a rabbi—were right within my reach. So I met with the rabbi and began to study with a tutor she recommended, taking my first steps towards Judaism, wondering if my decision was right. After all, what did I know about being Jewish? What had the five-year-old who first wanted to be Jewish known about it? Nothing, except that it was different and what I had seen of it I liked. I liked the holidays, the songs, the dreidels at Hanukkah, the Passover seders. I liked the Jewish people I knew. But the philosophies, the beliefs, the part of the faith that went beyond holiday food, were a mystery to me. My first visit to services, alone and bewildered, in February 1997, and the beginning of Hebrew study in preparation for my bat mitzvah (the Jewish coming-of-age ceremony, held at age 13) were steps into a dark room, lit faintly by childish hopes.

### Embracing Judaism

For the rest of the spring, I attended services each week and worked with my tutor, Talia, on the Hebrew alphabet, which I quickly mastered. But I did so only because

# Searching for Faith

by Jessica Leight

I had said I would, not because I truly wanted or believed in Judaism. Then, in June, I attended the bat mitzvah of a school acquaintance. As I watched and listened to the tears of joy, the parents' pride, the speeches, the readings by friends and family, something changed. Suddenly, I wanted my bat mitzvah, and this desire for the celebration grew into a desire for the whole of Judaism. When Talia and I met again in September, my heart was in the words we studied. And as the hours of preparation for my bat mitzvah consumed more and more of my energy, I became more and more confident that I had chosen the right faith. One of the most important tenets of Judaism is a happiness, an excitement, a wonder at the world as it was created. I have felt that wonder all my life, and it became my most important connection to Jewish belief.

But doubts lingered, as they still do and perhaps always will. In more bleak moments than I can count, the sexism, bloodthirstiness, egocentricity, and conservatism of the Torah and parts of the Jewish establishment left me feeling that I would never find a place in Judaism. Always, Talia reassured me that I was right in my choice of faiths. Extraordinary in the strength of her faith in Judaism, she nonetheless had the same questions and anger about the Torah that I did. With her, I was never afraid to voice that anger. Elsewhere, I was cautious, afraid that if I challenged Judaism, people would say I wasn't really Jewish. But Talia believed that my embrace of Judaism was stronger, deeper, and more enduring than my many confrontations with the Torah. She believed that I was moral and compassionate. She believed that I loved life. And those two qualities, morality and

joy, made me a Jew to her, despite my other ideological clashes with Judaism.

### Fulfilling the Mitzvot

On May 2, 1998, 6 Iyar 5758 by the Jewish calendar, I had my bat mitzvah. Showered with congratulations and praise for my dedication, determination, and maturity in choosing a faith, I became a Jewish adult, responsible for fulfilling the Torah's mitzvot (commandments). With a gold Star of David around my neck, and without my beloved Talia, who left Cambridge early in June, I began to cope with the fact that a dream had become reality—and the reality, as always, was not as perfect as the dream.

In the months since my separation from Talia, I have learned how difficult it is to be Jewish alone. I have my congregation, but I do not have someone close to me who can help in my constant struggle to reconcile my feminism and liberalism with Judaism. I wish I could say that I always feel completely Jewish, but the reality is that I don't. I work for every moment of faith I achieve, as I work for every moment of success in other endeavors. Every moment when I believe that I am Jewish and Jewish beliefs are mine, every moment when I believe that kissing my fingers in a gesture of reverence after touching the Torah is not a betrayal of my liberalism, feminism, and tolerance—all those moments are worked for.

Would it be different if I were a "real" Jewish child, born into a "real" Jewish family? One of my greatest comforts is that the answer to that question is no, for it reminds me that my struggle is not the mark of a "non-real" Jew. It is the mark of someone who is trying each day to redefine her religion as something alive and meaningful and growing. Judaism has been a long and at times arduous journey for me. But I'm not sorry I began walking. It is in the journey that I will find, and have found, the faith I seek. ♫

A freshman at Cambridge Ridge and Latin High School, Jessica Leight writes for the school paper, tutors, and is a member of the science team. If you'd like to discuss a conversion decision, you may send her email at [pleight@fas.harvard.edu](mailto:pleight@fas.harvard.edu)

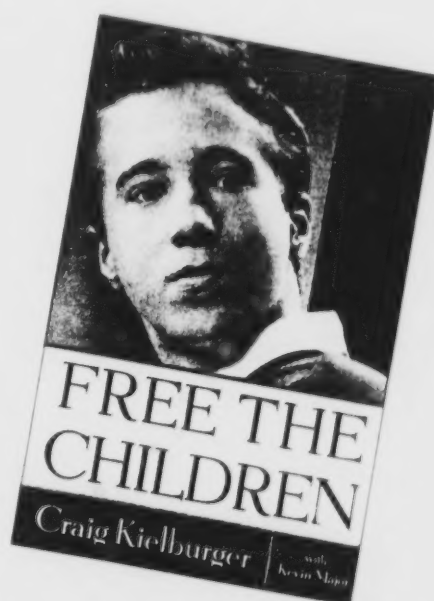


In the March/April 1997 issue of *Imagine*, we told the story of 12-year-old Craig Kielburger and Free the Children, the organization he founded after learning about the murder of another 12-year-old boy: Iqbal Masih, an escaped child laborer who exposed the horrific conditions experienced by children working in Pakistan's carpet industry.

Now 15 years old, Craig has written a book with award-winning author Kevin Major about the beginnings of FTC and its growth into an international effort to protect children's rights. Craig hopes that this book "will awaken in many people, especially young people, the urge to do something to end exploitative child labour."

# Children Speaking for Children

by Melissa Hartman



maimed or killed by explosions. They worked in carpet factories like the one Iqbal had escaped from. They worked as prostitutes and beggars. One young girl sorted into buckets the recyclable parts of used syringes, which she pulled apart with her bare hands.

Craig knew that he couldn't wait until he returned to Canada to start helping these children. Two weeks after his journey began, at a press conference in Calcutta, Craig spoke in support of children in India who had protested against child labor. In Delhi, he organized his own press conference so that two children recently rescued from a carpet factory could tell their stories. There, he and 10-year-old Asmita Satyarthi presented "A Joint Declaration between the Youth of India and Canada," asking that the governments of their respective countries help to eliminate exploitative child labor. And in Islamabad, Craig arranged a meeting

with Canadian Prime Minister Jean Chrétien, who was in South Asia to promote trade, and encouraged him to support a policy forbidding the purchase of goods from companies that violated child-labor laws.

## The Power of Youth

Since Craig's return from Asia, Free the Children has grown into an international organization with chapters in countries around the world, including Bangladesh, Croatia, England, India, Pakistan, and the U.S. And FTC has started to make a difference for children by establishing "Friendship Schools," a program in which schools in industrialized countries support poor schools in developing countries; by building a rehabilitation and education center for rescued child laborers in India; and by helping to provide alternative sources of income, such as milking animals and sewing machines, to villages in Southern India. For such work, Craig and FTC have been recognized with the Roosevelt Freedom Medal, the State of the World Forum Award, and Canada's Governor General's Award for Meritorious Service.

It never occurred to Craig that his age should prevent him from helping children around the globe. In fact, his youth is exactly what made him feel both qualified and obligated to do so. And although he still meets adults who have no interest in hearing children's voices, he continues to believe in the power of children to change the world:

*Children are not simply empty vessels to be filled. They are people with ideas, talents, opinions, and dreams. Children believe they can fly, that there is nothing to stop their dreams from coming true... Because we are young, full of ideals, full of dreams, we are not afraid of taking an idea that to some seems impossible and striving to make it a reality. Because children are dreamers, they are unstoppable. Because they are idealists, they always have faith in a better tomorrow.*

## The Real World of Child Labor

At the heart of *Free the Children: A Young Man's Personal Crusade Against Child Labor* is the narrative of Craig's seven-week mission to South Asia. Accompanied by Alam Rahman, a 24-year-old human rights activist he met through the Youth Action Network, Craig sought out child laborers in cities in Bangladesh, Thailand, India, Nepal, and Pakistan.

In every city, he met working children as young as eight years old. They worked in fireworks factories where many children were

To find out how you can help put an end to child labor, contact Free the Children, 12 East 48th St. New York, NY 10017, [freethechildren@cio.com](mailto:freethechildren@cio.com), [www.freethechildren.org](http://www.freethechildren.org)

And check your local bookstore for *Free the Children: A Young Man's Personal Crusade to End Child Labor* (HarperCollins, 1998).

# Building a Cross-Cultural Career

by Gina Bombaci Peirce

WHEN I CHOSE TO FOCUS my studies and career on Eastern Europe, a region many Americans see as remote and incomprehensible, a lot of people assumed that my ancestors must have come from that part of the world. But they didn't. I am simply fascinated by the dramatic changes in political, economic, and social life that have taken place in Eastern Europe and the former Soviet Union since the collapse of communist governments in 1989-91.



View of the Týn Church and other buildings on Old Town Square in Prague

This interest in East European affairs has led to my current job at the Pittsburgh Council for International Visitors, where I help administer an educational program for professionals from Ukraine, a nation that became independent from the Soviet Union in 1991. My preparation for this job took place over nearly a decade of various cross-cultural experiences.

## Customizing My Education

Even before I knew what career I would pursue, I took advantage of my high school's course offerings that related to cross-cultural studies. I took four years of Spanish beginning in middle school, when I was not yet focused on Eastern Europe. Then, in 12th grade—by which time the Berlin Wall had come down, focusing my attention on that part of the world—I took an intensive German language class. I found learning new languages extremely satisfying, especially because I supplemented the

experience with relevant extracurricular activities: As a member of my high school's foreign language club, I learned international songs, recipes, and crafts.

I also found that I could pursue my cross-cultural interests by undertaking projects specific to areas I wanted to study. For example, for a paper assignment in my American History class, I wrote about the origins of the Cold War. In my senior year, I designed an independent study course that culminated in a research paper on national independence movements in the republics of the USSR. This self-guided research not only helped me focus on personal interests but also provided excellent preparation for college.

## Refining My Focus

At the College of Wooster, I planned at first to major in International Studies. However, I decided that a major in Political Science with a minor in Russian Studies would fit my interests better, in part by allowing me to focus more specifically on a particular world region. I continued my study of German during my first two years of college and also took two years of Russian before graduation. I also took several international politics courses and a comparative religion course. These courses enabled me to understand world events through a more global, rather than strictly American, perspective—a vital component of an internationally oriented career.

College also provided an abundance of cross-cultural extracurricular activities to complement the knowledge I gained from books and lectures. During my first year, I lived with a Malaysian roommate in an international dormitory that housed students from all over the world. Subsequently I lived in German House, a suite where residents spoke German daily and often prepared German meals and watched German

films. I also joined the International Students Association to take part in activities such as cross-cultural dances, dinners, and fashion shows.

But by far the most important experience of my college career came in my junior year, when I spent a semester studying in the Czech Republic. College provided the ideal opportunity to travel abroad because I could apply my regular financial aid package to study in a foreign country through a program co-sponsored by my school. (It is helpful to know soon after starting college that you intend to study abroad so that you can be sure to fulfill all requirements for graduation during your time on your home campus.)

I spent the fall of 1993 studying in the little-known (at least to Americans) university town of Olomouc in the Moravian region of the Czech Republic. Czechoslovakia had peacefully split into the Czech Republic and Slovakia at the beginning of that year. The Czech Republic was one of the stars of Eastern Europe in terms of its political and



Town Hall on Upper Square in Olomouc



economic development since the old authoritarian regime was deposed in the 1989 Velvet Revolution. It was well on the way to a fully functioning democracy and market economy. By traveling there, I hoped to learn how the Czech Republic achieved this success when several other countries in transition from communism had not.

Touring the country by bus, I saw the breathtaking beauty of Prague, as well as fairy-tale castles, pastel houses, and cobblestone streets all across the countryside. Yet life in East Central Europe was a shock in several ways. Although many citizens of Prague spoke English, few did so in Olomouc, and I was frustrated by my inability to ask for what I wanted in shops and restaurants. An intensive Czech language class helped somewhat to alleviate this problem by the semester's end. Certain consumer



*McDonald's in central Olomouc in 1997.  
It will not be open in 1998.*

items common in the West, such as breakfast cereal and contact lens supplies, could be difficult to find; hot showers were scarce; and the need to pay to use public restrooms was a surprise. I learned that many Czechs were on waiting lists for home telephones.

Through my classes at Palacky University, I absorbed East Central European history, politics, and literature. With weekends free for field trips, I visited a total of eight European countries—train travel was convenient and, at least in the East, inexpensive. I returned to Wooster to write a junior and then a senior thesis comparing the process of democratization in the Czech Republic and Poland.

### Deepening My Knowledge

The next step for me was graduate school at the University of Michigan in

Ann Arbor, which had one of the top-rated programs in Russian and East European Studies (REES) in the country. To be admitted to the program, I had to take an accelerated third-year Russian language course during the summer before I started graduate school. In less than two months, I studied a full academic year's worth of course material! In the fall, I took a course in political Russian and also resumed studying Czech. These language courses have proven very valuable in my interactions with citizens of East European countries in both my travels and my job.

While completing a combined master's degree in REES and Political Science, I went to Prague to take part in the American Institute on Political and Economic Systems, co-sponsored by Georgetown and Charles University (founded in 1348, the latter is the oldest university in Central Europe). I spent nearly a month studying the ongoing East European transitions and exploring the most beautiful city I have ever seen. Unlike the students in my previous study abroad experience, most

of my classmates were from Eastern Europe and the former Soviet Union rather than the U.S. Hearing their perspectives on developments in their home countries greatly enhanced my time in Prague. I was also interested to observe the growing commercialization of the Czech capital city. Clearly, capitalism had taken firm root despite some lingering economic difficulties.

### Beginning My Career

When I finished my graduate studies, I moved to Pittsburgh. I have found that the largest number of internationally oriented jobs are located abroad or in Washington, D.C., so I was pleased to secure a position with the Community Connections Program at the Pittsburgh Council for International Visitors (PCIV).

Funded by the U.S. Information Agency, the Community Connections Program arranges for groups of judges, lawyers, local government officials, and business people from the city of Donetsk, Ukraine, to meet with their counterparts in Pittsburgh, to attend seminars and cultural events, and to live with American host families. Working with this program gives me the opportunity to



*Homemade Ukrainian bread on display at a Thanksgiving feast at the home of one of the host families for the Community Connections Program in Pittsburgh (Author is third from left.)*

learn about the latest developments in Ukraine from insiders, to practice speaking Russian, and to contribute to an effort to make democratic government and market economics function more effectively in a nation that recently gained its independence.

Cross-cultural careers may be in the nonprofit sector, government, education, or private business. Whichever path or paths you choose, seeking out cross-cultural experiences in high school, college, and beyond will provide you with excellent career preparation. Even more importantly, it will bring fun and fascination, and will make you a well-informed global citizen capable of understanding events and people all around the world.

*After beginning work with PCIV in 1991, Gina Bombard Peirce has worked with five groups of Ukrainian visitors who stayed in Pittsburgh for periods ranging from two to four weeks. In the future she hopes to return to the Czech Republic and to visit Ukraine and Russia.*



# The World of the Maasai

by Trevor Winstead

*As the turbo-charged Range Rover raced up the hill and disappeared over its crest, I realized there was no turning back. I had decided to spend the next three days living with the Maasai in a remote part of Kenya, and I would have to stick with my decision. My new environment was very different from my home in Washington, D.C., and I hardly knew what to expect. I was filled with excitement and some trepidation.*

IN THE SPRING OF 1998, I received the Eisenstein Fellowship to spend five weeks studying at Mpala Ranch in Laikipia, Kenya, approximately 230 kilometers northwest of Nairobi. My studies focused

continue to live in traditional villages known as *manyattas*. Soon after my arrival in Kenya, I arranged to spend three days and two nights at a *manyatta* an hour's drive from Mpala. On Monday, June 15, I was riding down nameless dirt roads on my way to an adventure I would never forget.

## New Kid in Town

With a camera in one hand and a backpack full of bottled water, a wool blanket, and Pepto-Bismol tablets in the other hand, I followed the *manyatta's* chief through the thorny *boma* (the fence surrounding the *manyatta*). Clad in a tee shirt and khaki shorts, I walked into the center of the *boma* and surveyed my surroundings.

Several six-foot-tall men wrapped in red and white checkered cloth emerged from their five-foot-high mud and stick huts, followed by their families. The groups then gathered outside the huts and fixed their eyes on the strange apparition in their midst: me. Some of the children, seemingly fascinated by my appearance, ventured

closer to get a better view and stood in a tight circle around me, examining my alien attire and poking the air bubbles in my Nikes. Joseph, one of the *manyatta's* leaders, led me to one of the ten 15x20-foot huts, each of which housed a family, where I would eat.

When Eric (my English-speaking host) and I ducked into the hut, I was blinded and choked by thick, dry smoke. I stumbled over to a stick bed, arms outstretched to

avoid colliding with anything. I didn't want to be rude, but I couldn't open my eyes and see clearly for several minutes.

Americans like well-ventilated homes, but this hut was actually designed to trap smoke. Like most homes of this generally tall people, the hut was low, with a flat roof and no chimney. Such cramped quarters may seem uncomfortable, but the Maasai build them this way to prevent malaria. Even after the fire stopped burning, the hut would remain smoke-filled throughout the night, repelling the mosquitoes that carry the potentially fatal disease.

I eventually adjusted to the smoke and looked around. The hut had an entrance on the side and two large beds/seats built into the wall on either end about two feet from the ground. A stone-lined fireplace dominated the center of the room, and a stick shelf on the wall behind it held pots, cups, and plates. Once I got used to the smoke, I found that the hut had a very cozy, comfortable feel that I soon grew to enjoy. After a lunch of meal bread, vegetables, potatoes, and very sweet tea (their staple drink), I followed Eric outside to watch a ceremonial dance.

## Dancing Lessons

We stood in the center of the village while a young man blew into a hollowed eland horn that let out a long, low-pitched bellow. A few minutes later, we saw a line of elaborately painted teenaged warriors winding their way down a path towards the *boma*. They passed two by two through an opening in the thorn fence and gathered in the center of the enclosure. The boys carried tall iron spears, knives, and short throwing sticks. Their hair was dyed red-brown, and they wore many colorful and ornate beaded bands around their foreheads, necks, arms, wrists, and ankles. Clad in bright red clothes, they looked quite intimidating.



Young Maasai honey gatherer

on the Maasai, a semi-nomadic tribe originally from the Sudan who came to inhabit a large part of Kenya. Sickness and famine drastically reduced their numbers in the 1800s, but they have since recovered and become a symbol of tribal Africa with their distinctive red and white attire, elaborate beaded jewelry, and ceremonial dances.

Despite growing pressure on Kenyan tribes to abandon their herding economies and adopt a Western lifestyle, many Maasai

Once they had gathered together, the warriors began to sway back and forth and chant in Swahili. I was spellbound and stood staring until Eric asked if I wanted to join in. I hesitated, trying to determine the rhythm, then jumped into line behind one of the young warriors. After a few minutes of trying in vain to imitate their cadence, shouts, and undulating motions, I retired to the sideline and enjoyed the rest of the dance as a spectator.

After a few more minutes, the boys formed a line, still singing and dancing. The front boy took several large steps away from the group, then leapt into the

quickly handed it back, trying to decline politely, and he did the job.

I planned to spend the next day touring some of the surrounding land on camelback. Camels, I discovered, are not the easiest animals to ride—and seem to enjoy practical jokes. Back at the large *manyatta*, I tried, under the direction of a young Maasai boy, to sit on a kneeling camel. The camel would, as I understood, stand up after I had gotten a proper hold.

So I swung my leg over its back. When I made contact, the camel immediately shot up. As I picked myself up after a six-foot fall, the spectators burst into laughter.

A little shaken, I tried again, this time determined to jump onto his back and instantly grab the large hump for support. This time I succeeded, but nearly fell off again as the sitting camel stood, creating a

rocking motion by extending its back legs first. I managed to hang on and finally enjoyed the thrill of sitting on a moving camel. A mile outside of the *manyatta*, however, I hopped off my uncomfortably lumpy mount and walked the rest of the way.

### I Say Farewell

The next morning, I visited a nearby school where the *manyatta's* children are educated. The schoolhouse itself was a long wooden building divided into eight classrooms that hold 30 children each. Because the students advance by skills rather than by age, each teacher works with children of different ages yet equal abilities. I met and spoke briefly with the principal and was quite impressed by the students' manners in a class we visited. Many of them asked



Residents of the *manyatta*

questions, in English, about my school, the United States, and me.

Later that morning, the owner of Mpala arrived to pick me up. After saying goodbye to my gracious hosts and thanking them for all they had done, I returned to Mpala to spend the rest of my stay studying at the ranch and enjoying its impressive wildlife.

When I reflect on my experience with the Maasai, I am saddened by the difficulties they face as the modern world exerts pressures that may someday destroy *manyattas* like the one I visited. Herding tribes like the Maasai generally disapprove of the concept of land ownership, so they didn't lay claim to the grazing land they roamed for centuries. But in the past few decades, land developers and conservationists have grabbed much of this land, forcing the Maasai to remain more sedentary. They have recently come into conflict with the Kenyan authorities as ranches, wildlife reserves, and development have further limited available land.

The Maasai have, for the most part, adapted to this unfair situation. Many of them have also been able to resist the forces of Westernization that have drastically altered the lifestyles of some neighboring tribes. While maintaining a herding economy, the Maasai have incorporated just enough modernization to survive and have done a remarkable job of keeping the rest of their culture intact. ☐

Trevor Winstead is a senior at St. Alban's School in Washington, DC. He enjoys playing hockey and classical piano, and writing for the school newspaper. He plans to study biology, philosophy, and Japanese in college.



A dancer leaps

air (nearly three feet up!), giving a loud cry. After landing, he proceeded to the back of the line while the next boy took his turn. Meanwhile, many of the mothers and children formed small circles near their huts and took turns dancing in the center.

### Adventures in the Animal Kingdom

After the dance, Eric and I hiked to a small enclosure on a nearby hill where I would spend the night with a family who lived there. I spent the afternoon collecting thorn branches to help repair weak portions of the barrier. When I had finished, Eric explained that we were going to eat goat for the evening meal. After selecting one of the older male goats from the hundred or so within the *boma*, he offered me the honor of killing it and handed me a large knife. I



Exploring Slovak castle ruins, '94-'95

IN THE SPRING OF '95, my high school classmates were renting tuxedos and limousines as they prepared for the sophomore prom. I missed out on that experience. In fact, I missed every event at La Grande High School my sophomore year. I traded them for the events, sights, and sounds of Slovakia. Three years later, while my classmates were finishing their freshman year at college, I was playing with monkeys in a South American jungle. Ecuador had become my third home as I spent another year immersed in a new culture.

When I returned to the U.S. last summer, I was fluent in three languages and able to understand nine. I had three families around the world, separated by attitudes, oceans, and the equator. I had honed my skills of tolerance, understanding, and communication. Through my experiences with the American Field Service (AFS), I not only discovered completely new and wonderful cultures, I discovered myself.

# Leaving La Grande

by Johnny Bennett

## Eastern Oregon to Eastern Europe

In August 1994, I left my little Oregon town and arrived in Bratislava, the industrialized capital of Slovakia. My small-town mind was littered with visions of crime, filth, and poverty. I was having second thoughts about everything. I was worried about my family back home, my friends, and myself. Most of all, I was nervous.

I was about to meet and live with a group of strangers. My mind raced with these thoughts as we entered the city. But when I saw the huge castle towering over the houses in the center of town, I knew I was embarking on an adventure, and my negative thoughts quickly disappeared.

When I met the Mikloshes, my new family, I experienced an indescribable feeling. I was shaking hands with complete strangers—strangers who had opened their hearts and home to me. The success of my

exchange hinged on the quality of my relationship with them, so I had to work to become compatible with them. I had to find what held the family together and become a part of that. It wasn't easy, but by the middle of the year, we were exchanging jokes; and by the time I left, I was wrestling with them and saying things that I would say only to my natural family.

School was a different case altogether. I was assigned a class, and then a classroom. In Slovakia, the kids remain together in the same room while the teachers rotate around. In this way, I quickly saw the strong bond formed between classmates. In order to fit in, I needed to learn the language, which proved extremely difficult. I had figured that it would just come naturally, but their language sounded like someone playing a tape in reverse. I realized that I was facing months of mistakes, frustration, and hard work.

## Becoming Slovakian

As my language skills improved, I found I could be myself. People could see that I actually had a brain. As I picked up phrases, I spoke less and less like Tarzan and more like a student interested in the Slovak way of life. The language provided a connection to my family and friends, and allowed me to perform simple tasks, such as calling people on the telephone and buying a meal confidently. I was starting to feel like a Slovak.

But it wasn't just speaking Slovak that made me feel like a Slovak. It was also catching







*The beautiful Indian market  
of Cuenca*

myself nodding my head while saying "no" (the Slovak slang for "yes"). It was learning classical dance and playing in their basketball league. It was attending professional soccer games, symphonies, and Broadway plays performed in Slovak. It was a combination of the language, the people, the traditions, the humor, and the food—which all came into conflict with my American upbringing.

### **Destination: Ecuador**

When I returned to La Grande, I was homesick for the small housing development beside the Danube River. Adjusting to my old lifestyle was as hard as it had been to adjust to the Slovak way of life. I couldn't relate to my friends in the same way. In fact, I completely switched groups of friends. Now I was more interested in people who looked beyond our little valley. I felt like I had matured five years while my classmates had barely changed at all.

From the day I reluctantly left Slovakia, I knew I wanted to go abroad again. But since I didn't want to miss my junior or senior year of high school, I decided to wait until after graduation. During the next two

years, though I assimilated into my old lifestyle and became involved in school, the only thing on my mind was another AFS exchange: this time to Ecuador.

In Slovakia, Americans made up only a small number of the exchange students, a diverse group of 25 young adults from countries including Brazil, England, New Zealand, and Ecuador. One student in particular, an Ecuadorian named Boris, helped me adjust to Slovakia and, at the same time, shared bits and pieces of his own culture. We became close friends over the year, and gradually I decided that I wanted to experience Ecuador in the same way that I was experiencing Slovakia. Fortunately, unlike countries such as France,

Italy, and Spain, Ecuador accepts exchange students who have already graduated.

Again, the excitement welled up inside as I began preparing for my year-long sojourn. I said goodbye to my family and friends with a smile on my face. I knew that when I returned in a year, it would be as if somebody had pushed the pause button once again on my life in La Grande.

### **At Home in Paradise**

After a brief orientation in Quito, I flew to Guayaquil, a city with a population of three million. From the beginning, I dove into the language, learning 40 to 50 words a day. I explored the city, ate at different restaurants, and spoke with the natives. Within the first three months, I knew the coastal city of Guayaquil as if I had lived there all my life.

During my exchange, I experienced each of Ecuador's three main terrains: the coast, the mountains, and the jungle. On the coast, I spent hours relaxing on beaches, swinging in hammocks, and enjoying incredible seafood. In the mountains, I fished in streams, spoke with Quechua Indians, and climbed to an elevation of over 20,000 feet. And in the jungle, I saw boa constrictors, played with monkeys, and took canoes through the rain forest. I even had a chance to visit the famed Galapagos

*Continued on next page*



*Ecuador '97-'98:  
Kayaking near a river village outside Guayaquil*

Islands, where I saw turtles weighing more than refrigerators and went scuba diving with baby seals.

As in Slovakia, I attended school. However, because the Ecuadorian school year begins in April and ends in December, I had four months of "summer vacation," during which I traveled to the beach, visited my host family's relatives or my friend Boris in the mountains, or just relaxed in a hammock and studied Spanish. When I returned to school in April, I really didn't have a place there because my class had graduated in December. But I was able to work out another arrangement with the school: a professor had left, so I would fill in for her, teaching English to high school juniors and seniors.

At times it seemed that I was living a dream. But the year wasn't entirely perfect. I witnessed poverty that most Americans can't comprehend. On the streets, children would crowd around us, hoping to get even a quarter to buy food that day. Never in my life had I felt so helpless. Adding to the distress of the poor was the onslaught of El Niño. As nature took its course, cities were buried by the incredible downpours (sometimes a foot and a half of rain would fall in a matter of hours). This caused even



Playing with a monkey  
in the Ecuadorian jungle

more families to go homeless, hurting an already flailing economy. Fortunately, the Quintatnas, my host family, helped me to see past the destruction and take advantage of everything Ecuador had to offer.

**A**t 20 years old, I have seen parts of war-torn Europe, helped orphans in South America, and been an English teacher. I

have a library of photos and two journals that sum up two different lives. Most of all, I have learned about the world from many perspectives. I have learned to see what is in people's hearts and not to judge them by my cultural standards. I was able to get beyond the excitement of tourism and find the fulfillment of understanding,

becoming a better person in the process. I now have three homes around the globe. Thanks to AFS, these three cultures shape who I am, and who I will be. ☺

*Johnny Bennett is a freshman in the honors program at Gonzaga University, where he is majoring in physics and computer engineering. A volunteer for the Spokane chapter of AFS, he also aids in the ESL Program at Spokane Community College. His upcoming travel plans include a semester program at Oxford University and visits to both AFS host families. Johnny hopes eventually to teach at a South American university.*



Galapagos Islands '98:  
Kissing a marine iguana

AFS offers year, semester, and summer programs for high school students and recent graduates in countries in Europe, Africa, the Americas, Asia, and the Pacific. For more information, call 1-800-AFS-INFO for a free catalog, or check out the Web site at [www.afs.org/usa](http://www.afs.org/usa)

*Most students seeking additional challenges find them through enrichment programs, magnet schools, college courses, or early college entrance. Many of these options are available to students at home. Life and study at boarding school offer unique challenges and opportunities for personal growth. Obviously, boarding school is not for everyone, but it can be a great preparation for college life. In this article, one student shares his experiences at a boarding school on the coast of Southern California.*

WHEN I ENROLLED as a freshman at Cate Boarding School in Carpinteria, California, I was shy and unsure of myself. I relied on my parents for everything. Now, two and a half years later, I wonder how differently my life might have turned out if I hadn't come here. Would I have had enough discipline and self-confidence to attend summer school at UCLA or work for the American Red Cross? Would I be the same independent person that I am today? I doubt it.

I first considered Cate for its academics. I was impressed by its broad range of courses, as well as the variety of sports and other extracurricular activities. But when I saw Cate's lush grass, Spanish-style architecture, and magnificent view of the Pacific Ocean, I was astounded. And when I noticed students playing and relaxing under the palm trees, I knew that this was the school for me.

### From Isolation ...

Despite the beautiful surroundings, when I first arrived at Cate, I hated it. Sharing a bathroom, phone, and living space with so many strangers was difficult. At first, my roommate and I did not get along. I found studying with stereos blasting at 20,000 decibels nearly impossible. I also missed my family, especially my sister, with whom I was very close. Immersing myself in homework and sports, I tried to forget about how much I wanted to go home.

During Christmas break, I locked myself in my room and refused to come out, hoping my parents would let me move back home. My parents consoled me and eventually I agreed to return to Cate. I also talked to a friend who attended another boarding school. He told me that if I made some friends and got more involved on campus that I would be happier at Cate.

### ...To Community ...

I took my friend's advice to heart, and on the day I returned from Christmas break, I took a chance and walked into the room of my classmate Davis. He and his friend Eric were surprised to see me because I had spent the previous three months sequestered in my own room. We began talking about what we had done over the break, and soon we were spending lots of free time together. Over the next few months, I made more friends from all over the world. My friend Zack, who is from Saudi Arabia, and I are so close that sometimes we even do each other's laundry!

## The Boarding School Experience

by Ravi Janumpally

Making friends is part of any school experience, but Cate makes special efforts to foster a sense of community among the students. As Cate's founder once said, "Our students are not a group of intellectuals; they are one closely-knit unit." Formal Thursday dinners are a chance for the entire school to come together, students and faculty alike. Throughout the year, Cate sponsors numerous expeditions that give students time to get to know one another. Just recently, the junior class went on a retreat to a mountain-top resort. After two days spent discussing personal topics like alcoholism, stress, and family, I feel that I know my classmates as well as I know my own family.

I have found that these expeditions also offer opportunities for growth of another kind. On a class trip to Santa Cruz Island, I discovered my ability to overcome fear. During one of our hikes, I was required to kayak one mile from Pelican Bay to Scorpion Bay. At first, I flatly refused because I had always had an immense fear of kayaks; I was afraid the kayak would tip over and drag me to the bottom of the ocean. The outdoor instructor patiently explained that the kayak would not tip over unless I jumped out of it. He also assured me that if the kayak tipped over, my life suit would protect me from drowning. These few words

of reassurance helped me gather enough courage and determination to get into the kayak. An hour later I was rowing solo around the bay, feeling very proud of myself. Knowing that I could conquer my fears gave me an exhilarating sense of liberation.

### ...To Independence

This liberation also extends to more mundane achievements. Life at Cate has taught me self-sufficiency in things I had always taken for granted when I lived at home. Now I do my own laundry, shop for groceries, and get myself to class on time. While on kitchen crew, I served food, washed dishes, and cleaned tables. At home, my mom usually took care of those things. Taking on responsibility and knowing that I don't have to depend on my parents for everything makes me feel good about myself.

Taking on responsibility hasn't always been easy. Last year, I faced a rather difficult dilemma. While working as a student librarian, I caught a friend making a lot of noise. Although it was my duty to keep the library a quiet place of study, I also knew that I had to see him every day, that I couldn't just go home in the afternoon and forget about any enemies I had made at school. Still, I wanted to do the right thing and prepared myself to live with the consequences. After a short period of deliberation, I asked my friend to leave. I inwardly flinched as he left without a word, anticipating future confrontations. But the next time we met, rather than attacking me, he apologized.

At Cate school, I have learned a lot more than biology and calculus. I have had so much fun and grown so much that I recommend boarding school to anyone who wants to experience more than mere academics. It has been the greatest time of my life. I am now a junior and don't feel like a fledgling anymore. Boarding school has taught me about myself—that I have limitations, but am capable of doing more than I had ever thought possible. ■

Ravi Janumpally dreams of becoming a scientist or a mathematician. In the meantime, he enjoys Mock Trials, Odyssey of the Mind, writing for the school paper, reading Mad magazine, and sleeping.





# PLANNING AHEAD FOR COLLEGE

## The Advanced Placement Program

by Linda E. Brody, Ed.D.

**A**RE YOU A HIGH SCHOOL STUDENT looking for college-level course work? You may not have to look beyond your own high school if it participates in the Advanced Placement (AP) Program. AP courses are equivalent to first-year college courses and offer students the opportunity to broaden and/or accelerate their educational programs before enrolling in college.

Offerings through the AP program have expanded greatly in recent years, and courses or examinations are now available in Art (Art History, Studio Art), Biology, Calculus (AB, BC), Chemistry, Computer Science (A, AB), Economics (Macro, Micro), English (Language and Composition, Literature and Composition, International English), Environmental Science, French (Language, Literature), German, Government and Politics (Comparative, United States), History (European, U.S.), Latin (Literature, Virgil), Music Theory, Physics (B, C-Electricity and Magnetism, C-Mechanics), Psychology, Spanish (Language, Literature), and Statistics.

### Benefits of AP

An important benefit of AP courses is that you can earn college credit if you score adequately on the AP exams, which are administered in May each year at local high schools. Given the cost of college today, credit earned through this program can represent a considerable savings in tuition.

Individual colleges determine their own policies with regard to granting credit, but, in general, colleges are more willing to award credit for AP examinations than for courses taken by high school students at local colleges because the exams provide a standardized measure of what a student has learned. AP exams are scored on a scale of 1 to 5. Most colleges require a score of at least a 3 for awarding credit, while many selective colleges require a 4 or 5.

Earning college credit isn't the only reason to take AP courses. Rigorous, challenging courses, such as those offered by AP, can hone your analytical and study skills and broaden your content knowledge so that you will be better prepared to do well in difficult college courses. And, even if college credit isn't important to you because you plan to spend four years as an undergraduate, why not use AP credit to place out of introductory courses and use your time and tuition to take advanced courses? You might be able to graduate with a double major or with a master's degree in addition to your undergraduate degree.

Doing well in AP courses can also improve your chances of being admitted to the college of your choice. College admissions officers recognize that students who perform well in AP-level course work are likely to succeed in tough college courses.

### AP Scholar Awards

Students who participate widely in AP are honored by the College Board as AP Scholars. This designation, too, can have a

positive impact on college admissions decisions. There are several levels of award:

**AP Scholar:** Scores of 3 or higher on three or more AP exams based on full-year courses.

**AP Scholar with Honor:** Scores of 3 or higher on four or more exams based on full-year courses *and* an average grade of at least 3.25 on AP exams taken.

**AP Scholar with Distinction:** Scores of 3 or higher on five or more exams based on full-year courses *and* an average grade of at least 3.5 on AP exams taken.

**AP State Scholar:** One female and one male student in each state and the District of Columbia with grades of 3 or higher on the greatest number of full-year exams taken by students in the state *and* an average of at least 3.5 on AP exams taken.

**National AP Scholar:** Scores of 4 or higher on eight or more exams based on full-year courses *and* an average grade of at least 4.0 on AP exams taken. Awarded in both U.S. and Canada.

### Myths about AP

Several myths about AP courses need dispelling. The first is that AP is for 12th graders only. Actually, you should enroll in an AP-level course whenever you are ready for that level of content. For example, if you have accelerated in math, you may be ready for AP Calculus in 10th grade; or if you began to study French in middle school, you will be ready for AP French by your 4th or 5th year of language study, regardless of what grade you're in.

Another myth is that you can't take the AP exam unless you've taken the AP course. This is not true; you can prepare for the exam on your own. If your school does not offer AP Biology, for example, take the regular Biology course, obtain descriptions of the AP Biology curriculum and examination from the College Board, and study the additional topics on your own to prepare for the AP exam.

A third myth is that there's no reason to take an AP exam unless earning credit is important to you, even if you've successfully completed the course. On the contrary, the assessment is important so that you will know how well you have mastered the subject. This information will guide you in selecting appropriate college courses.

### Using Technology to Access AP

Like so much else in our lives, the AP program has been enhanced by technology. Check out the College Board Web site ([www.collegeboard.org/ap](http://www.collegeboard.org/ap)) for much information about the tests, as well as sample questions and access to an on-line store for ordering preparation materials. The Online Essay Evaluation Service provides an experienced reader to score a practice essay for you, and test preparation materials are being developed on CD-ROM. If your school doesn't offer an AP course that you want to take, distance-learning AP courses utilizing computer-based technology are becoming more widely available.

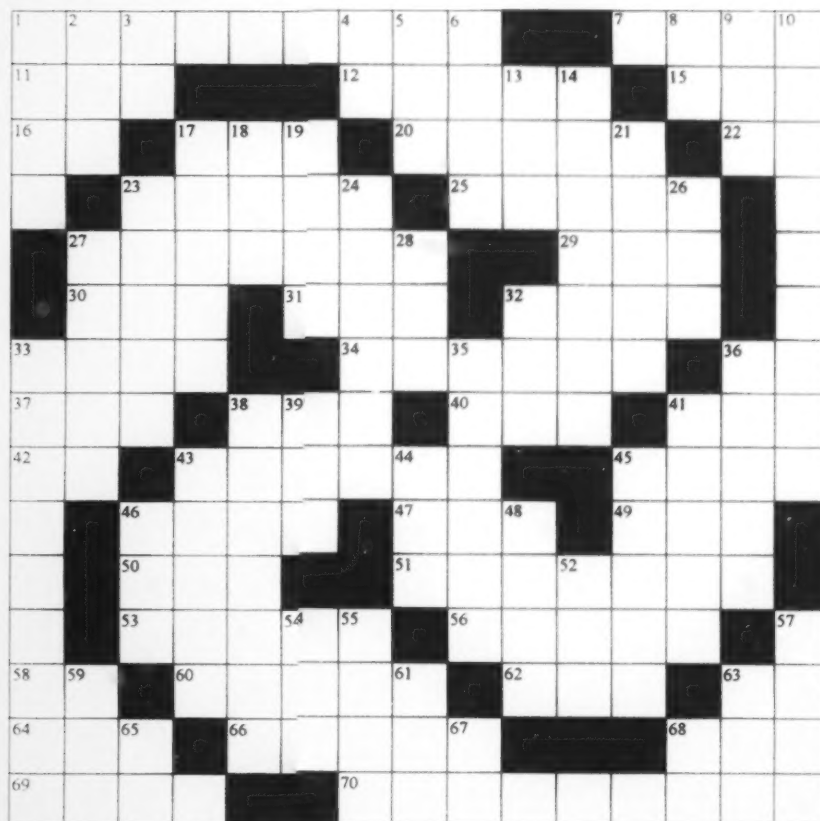
**I**n 1998, more than half a million students took more than a million AP examinations. While the AP program can't meet all the needs of students seeking a more challenging high school program, this program has brought a wide spectrum of college-level course work into high schools across the country. Don't miss the opportunities offered by AP to expand the scope and depth of your educational background before you go to college—and maybe earn some college credit, too. ■



# WORD WISE

by Carol Blackburn

## Cross-Cultural Studies



Constructed using Crossword Weaver

### ACROSS

- 1 Feast before the fast (2 wds.)
- 7 Beograd resident
- 11 Jean d' \_\_\_\_
- 12 Tribal symbol
- 15 \_\_\_\_-te Ching
- 16 Half of Y2K
- 17 Beautiful, in Florence
- 20 Unicorn, in Yokohama
- 22 Lawyer's degree
- 23 Javanese hand-dyed fabric
- 25 Lordless samurai
- 27 Go crazy, in Malaysia (2 wds.)
- 29 Long \_\_\_\_
- 30 Online transaction (abbr.)
- 31 Santa \_\_\_\_

- 32 Rowing team
- 33 Shaka's nation
- 34 Good news
- 36 San Juan, \_\_\_\_
- 37 European Geophysical Soc. (abbr.)
- 38 Graphics file format
- 40 Caliente
- 41 She, in Salzburg
- 42 That is (abbr.)
- 43 Lake, in Acapulco
- 45 Rational
- 46 "Brilliant" dynasty
- 47 Sprite
- 49 King \_\_\_\_
- 50 Beverage

- 51 Violent storm, in Baja
- 53 Turkish head honcho
- 56 New Zealand native
- 58 Intraperitoneal (abbr.)
- 60 Leafy vegetable
- 62 Us, in Vienna
- 63 Déjà \_\_\_\_
- 64 Blue
- 66 Remain faithful, in Judea
- 68 \_\_\_\_/yang
- 69 Nicholas was the last
- 70 Become a "son of the commandments" (2 wds.)

### DOWN

- 1 Cinco de \_\_\_\_
- 2 \_\_\_\_ of the Covenant

- 3 Roman Catholic (abbr.)
- 4 Route (abbr.)
- 5 Just fine, in America
- 6 Toss
- 8 "\_\_\_\_ tu, Brute?"
- 9 British rule in India
- 10 Buddha found enlightenment under it
- 13 Caball\_\_\_\_ or campañ\_\_\_\_
- 14 Mosque tower
- 17 African language
- 18 Arrival time, in airport lingo
- 19 Peruvian city
- 21 Quintessentially British name
- 23 Picadors' prey
- 24 Chinese martial art (2 wds.)
- 26 Pronto
- 27 Moulin \_\_\_\_
- 28 Examine, in Beijing
- 32 Chief petty officer (abbr.)
- 33 The spirit of the times, in Berlin
- 35 Peace, in Jerusalem
- 36 Spotted horse
- 38 Elephant-headed Hindu god
- 39 Immunoglobulin G (abbr.)
- 41 Arabian
- 43 Flowering bush, originally from Persia
- 44 Catch
- 45 Aldebaran and Altair
- 46 Cartographer's product
- 48 Herr's wife
- 52 Mais \_\_\_\_!
- 54 An unkosher food
- 55 Yemenite
- 57 Moon, in Madrid
- 59 La \_\_\_\_, Bolivia
- 61 Genetic material
- 63 Vivian, to her friends
- 65 Yes, to Yeltsin
- 67 Little Rock locale
- 68 AB's opposites

Solution on page 29.

Review by  
Diane Clavier & Melissa Hartman

**Melissa:** It's hard to believe that Carson McCullers wrote this deep and powerful novel at the age of 23. *The Heart is a Lonely Hunter* reveals the depths and isolation of the human spirit through the interweaving stories of five main characters: Mick Kelly, a preadolescent tomboy; John Singer, a 32-year-old deaf mute; Biff Brannon, the owner of the town's all-night cafe; Benedict Copeland, the town's African-American doctor; and Jake Blount, a young wanderer. Each chapter of the novel is written in the voice of one of these characters, and in each chapter we usually see at least one of the other characters.

**Diane:** The structure of the novel definitely reflects McCullers's background in music. She said that she intended the novel to work like a fugue, with different voices speaking in counterpoint to make a unified whole.

And like the melodies in a fugue, the lives and thoughts of the five characters play off one another in both parallel and harmonic structures. The voices are unique, but share points of intersection. And just like real people, each character is a mix of good and bad, reason and incomprehensibility.

**Melissa:** I especially enjoyed the chapters written in Mick's voice. Over the course of the novel—from May 1938 to August 1939—we see Mick grow from a rough-and-tumble tomboy into a young woman with a job.

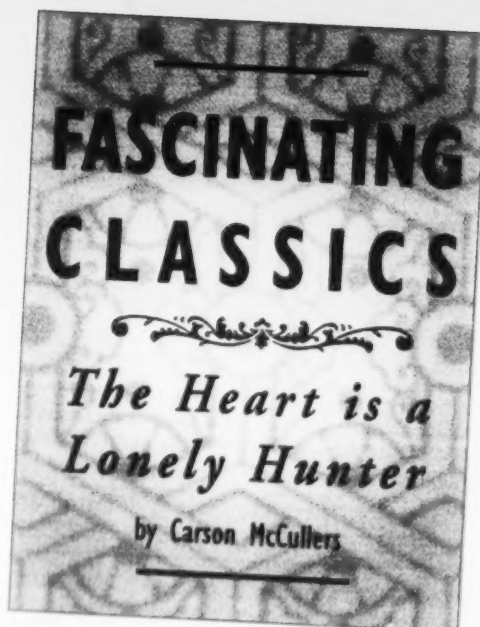
From the beginning, Mick is remarkably independent. She doesn't want to be like her two older sisters, preferring instead the company of her older brother, Bill. But after Bill dismisses her dearest project—building her own violin out of an old ukulele—as childish and silly, Mick spends most of her time alone or taking care of her two younger brothers.

**Diane:** Throughout most of the novel, Mick's solitude is so empowering that she rarely feels the loneliness experienced by some of the other characters. She is far too busy planning the things she'll invent when she gets older and listening to and composing music. Her family can't afford a piano or even a radio, but that doesn't stop Mick from pursuing her love of music. With her lunch money, she pays a

#### CARSON McCULLERS AND THE TRADITION OF THE GROTESQUE

Along with such writers as William Faulkner and Flannery O'Connor, Carson McCullers is considered a Southern Gothic writer. She earned this title in part for her use of the grotesque, which includes not only situations, scenes, and images composed of disjunctive elements (such as comedy and horror), but also abnormal characters marked by some incongruity or distortion.

But the tradition of the grotesque actually spans centuries and extends far beyond the South. Greek satyr plays that imposed ribaldry on serious themes, for example, were grotesque, as were the characters who appeared in them



girl at school for piano lessons in the gymnasium, and she roams the wealthier section of town at night, hiding in gardens below the windows to hear the classical music playing on the radio.

**Melissa:** I think Mick's love of music is her most defining characteristic. She responds emotionally, physically, and spiritually to what she hears, as on the night she first hears Beethoven's *Eroica* symphony:

*The outside of her was suddenly froze and only the first part of that music was hot inside her heart. She could not even hear what sounded after, but she sat there waiting and froze, with her fists tight. After a while the music came again, harder and loud .... This was her, Mick Kelly, walking in the daytime and by herself at night. In the hot sun and in the dark with all her plans and feelings. This music was her—the real plain her....*

*The whole world was this music and she could not listen hard enough. Then at last the opening music came again, with all the different instruments bunched together for each note like a hard, tight fist that socked at her heart.*

When the music ends, "there was only her heart like a rabbit and this terrible hurt," and Mick cuts her thigh with rocks to relieve the intensity of her joyful longing before falling into a troubled sleep.

**Diane:** I think this is one of the novel's most memorable moments. It shows that music is the most real part of Mick's life. Unlike her ambiguous image in the mirror—"either she looked like a sap or else she looked very beautiful"—music reveals her true self.

Music is a very private experience for Mick, one she discusses only with John Singer, who rents a room at the Kelly house after his companion Antonapoulos is committed to the mental hospital. Because Singer never speaks, Mick believes that he can understand all her hopes and plans; and even though he's deaf, she thinks he understands her feelings about music.

**Melissa:** In this way, Mick is similar to Jake and Dr. Copeland, who also regard Singer as the only one who understands them. They read his silent courtesy and hospitality as kinship and feel relieved to have such a sympathetic confidant. But neither Mick nor Jake nor Dr.

wearing animal masks. In Roman mime theater in the third century B.C., these characters evolved into stock characters, such as the fool and the glutton, that are the ancestors of Chaucer's pilgrims and the humorous characters in Renaissance drama and Restoration comedy.

Nineteenth century Gothic-Grotesque, however, stripped grotesque figures of their comic function. Their abnormalities and exaggerated traits—once displayed on their predecessors' masks—now had psychological roots. Goethe's *Faust*, Byron's *Manfred*, and Stevenson's *Mr. Hyde* all reflect an interest in characters' inner lives that carried into the twentieth

Copeland can understand what's in Singer's heart. They don't know how much he loves and misses Antonapoulos.

When Antonapoulos goes to the mental hospital, Singer stops using sign language altogether. He writes letters to Antonapoulos and yearns for his company. Yet Antonapoulos can't read, and it's not clear whether he comprehends Singer's sign language when Singer visits him at the hospital. But Singer is so eager to talk that he is blind to Antonapoulos's non-responsiveness. And like Singer when he speaks to Antonapoulos, Singer's friends are all so full of their own thoughts and passions that they can't see Singer for who he is. Jake doesn't even notice that Singer is deaf and mute when they first meet—he doesn't realize that he's done all the talking!

**Diane:** This humorous moment points to one of the novel's saddest themes—that people can never achieve real understanding, real closeness; that people are essentially alone. Singer is the novel's unifying presence—"Their thoughts seemed to converge in him as the spokes of a wheel lead to the center hub." Yet he seems to feel his isolation more intensely than any of the people who seek solace in his company.

Only Biff sees that Singer's silence allows people "to give him all the qualities they wanted him to have." He is annoyed by the way that Mick and Jake turn Singer into a "home-made God" and sees him instead as a mere mortal with his own needs and fears. Biff worries about these characters who have put all their hope and confidence in a man who doesn't even hear them.

**Melissa:** Still, Biff is intrigued by Singer, perhaps because he recognizes that they are both seekers. Like Singer, Biff says little, quietly trying to make sense out of his life. Also like Singer, Biff genuinely cares for others and reaches out to them—he gives free drinks and meals to people with physical handicaps, for example. And he tries to help Mick, too. He desires "to give to her. And not only a sundae or something sweet to eat—but something real. That was all he wanted for himself—to give to her." But none of his efforts are repaid. Mick thinks he hates her, attributing the gruffness in his voice to his knowledge that she once stole candy from his diner, and Jake openly acknowledges that he'll never pay Biff for the many meals and drinks Biff has given him.

**Diane:** Not only is Biff a likable character, but in his chapters, you can count on an objectivity that you don't get from the other characters. He always questions the meaning behind events, and unlike

the other characters, he attempts to come to terms with his past in order to find more happiness in the present and future.

**Melissa:** Unfortunately, the others don't seem to learn from the past. Jake, obsessed with Marxism, shouts the same abstract messages again and again to people who don't want to listen. And Dr. Copeland continues to distance his children by reminding them that they haven't lived up to his dreams for them. They repeat the same mistakes, frustrating any hope of establishing meaningful relationships, and confirming the title of the novel in the process.

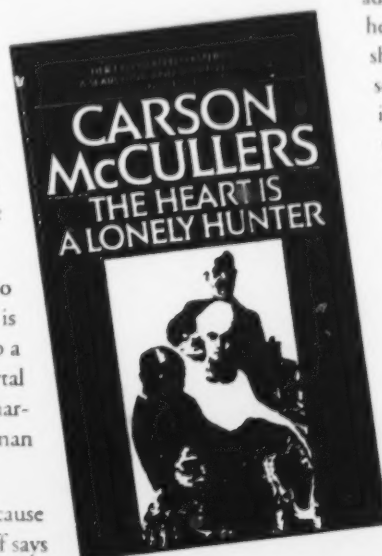
**Diane:** Although the frustration of Dr. Copeland and Jake is pitiable, I find the changes in Mick even sadder. As she moves into adulthood, she loses her ability to escape into her "inside room" of music and plans. When she takes the job at Woolworth's, quitting school and abandoning her dream of becoming a professional musician, she ceases to feel the joy with which her life had once been so full. She also loses her fearless boyishness and starts to resemble her contemptible older sisters.

**Melissa:** Mick is not without hope, though. In her final chapter, she reflects on her losses but refuses to give in to them. And I think the other characters have some hope, too. Jake heads off to another town, hopeful that he will finally move people to action with his message. Dr. Copeland moves to his father-in-law's farm, where he'll abandon his solitary existence and be surrounded by family.

**Diane:** But, as we've come to learn in this novel, hope is tenuous. Even as Biff awaits the sunrise, he is filled with fear, or at least skepticism:

*Somehow he remembered that the awning had not yet been raised. As he went to the door his walk gained steadiness. And when at last he was inside again he composed himself soberly to await the morning sun.*

Like Biff, by the end of the novel the other characters have learned that idealism can lead to disappointment. If their experiences have taught them anything, it is that life often demands a change in goals and expectations. Yet, McCullers does seem to suggest that if they let go of their painful obsession they may find fulfillment in unexpected places. Whether or not they are capable of doing so is left for us to decide. ■



century. Sherwood Anderson's 1919 *Winesburg, Ohio*, for example, tells the stories of grotesque characters who are defined by a certain "truth" (e.g., "poverty," "passion," "abandon") that has made them neurotic.

The grotesque functions as a psychological "freak" in McCullers's work but also gains another layer: all of her novels include characters with physical abnormalities. McCullers described these grotesques as "people whose physical incapacity is a symbol of their spiritual incapacity to love or receive love." Characters like the deaf and mute John Singer and the enormous Miss Amelia who falls in love with the

hunchbacked dwarf in *The Ballad of the Sad Café* allowed McCullers to give human form to the theme of spiritual isolation. Through what critic William Clancy calls "the fusion of horror and compassion," McCullers not only created several of the most important novels in Southern Gothic literature, but also secured her place in the tradition of the grotesque.

Upcoming Fascinating Classic:  
Emily Bronte, *Wuthering Heights*

# EXPLORING CAREER OPTIONS: PHYSICAL THERAPY

## Interview with Michele Ogden

by Melissa Hartman

*Michele Ogden graduated from the University of Maryland with a bachelor's degree in kinesiology and from the University of North Carolina with a master's degree in physical therapy. She now works as a physical therapist for the State of North Carolina at the Developmental Evaluation Center.*

*What attracted you to this field?*

When I was about 10 years old, a friend's father was badly burned in an accident. I used to go to the rehab center with them, and I would talk to the other burn victims and patients who had spinal cord injuries. They were so positive about the therapy they had received, and I saw how it helped my friend's dad. The ability to make that kind of difference in someone's life was really appealing to me.

By the time I got to college, I knew I wanted to go into physical therapy, so I majored in kinesiology, which is the study of muscles and their movements.

*Did you go directly to graduate school after you earned your bachelor's?*

No—I got married, had a child, and moved to a different state. And I should also say that I didn't get into p.t. school the first time I applied. Admission to these programs is very competitive. UNC required at least a 3.6 GPA in math and science courses, and most schools are strict about prerequisites. You also have to earn high scores on the GRE. I had to retake the GRE as well as the two courses in which I'd earned C's.

*Are there other specific criteria for getting into a physical therapy program?*

Most schools require a record of volunteer work in the field, so people who think they might go into physical therapy should start volunteering in high school and continue in college. Many places take student volunteers; you don't get to do much, but you can get a lot out of it just by seeing what happens and asking questions.



Photo courtesy of APTA

While some places do hire physical therapy aides, I'd caution against taking a paid position because you'll be less likely to get exposure to a wide variety of settings. It's more desirable to get experience in a lot of different places than to have, say, two years in a single setting. You could go into the school system and ask if you can shadow the therapist there. Or you could go to the local nursing home. There are lots of places to volunteer.

*What was your volunteer experience?*

I volunteered at two private orthopedic clinics and at a V.A. hospital. I was also exposed to a lot of therapy with my daughter, who has cerebral palsy, and that personal experience counted, too. I wrote about that in my admissions essay.

*What are some of the different areas physical therapists work in?*

Physical therapists work with many different kinds of patients in many different settings. We work in hospitals, nursing homes, home health agencies, rehabilitation centers, school systems, and private practices. We work in sports medicine, orthopedics, pediatrics, geriatrics. And we can also work with specific kinds of patients, such as

those who have suffered strokes, heart attacks, spinal cord injury, or brain injury.

*When does a physical therapist begin to specialize in one of these areas?*

A lot of people choose an area when they do their clinical affiliations. Students spend 40 hours a week in clinicals to get hands-on experience; it's just like going to work.

At UNC, we were required to do four affiliations in three different settings. We had to work in an acute care setting, which involves treating people who have been admitted to the hospital. We also had to do an outpatient orthopedic affiliation and a neurological affiliation, which involves working with patients who've suffered a neurological injury or with children who have neurological disabilities.

*What area did you decide to specialize in?*

I love children, so I chose pediatrics, and I did as many of my affiliations as I could in pediatrics. Outpatient is generally adult, but I did both my acute care and neuro affiliations in pediatrics. We could choose our fourth affiliation, so I did that in pediatrics as well.

*What do you do in a clinical affiliation? Do you treat people or just observe?*

Your first affiliation might involve a lot of observation because you haven't been trained in every area. But your advisors know what kind of background you have, and they'll let you do what you're prepared to do. Maybe you'll conduct a patient interview, and maybe your clinical instructor will be in there with you at first. But by your last affiliation, you do it all on your own.

In each affiliation, your clinical instructor grades you on a four-point scale in a variety of areas, such as documentation, evaluation skills, treatment, and teamwork. The points you earn reflect how independent you are. If you can handle a task independently, you earn a 4; if you're very dependent and can't be left alone, you earn a 1. By the time you're on your final affiliation, you're expected to earn all 4s.

*What happens if you don't do well on an affiliation?*

You'd have to repeat it, which would prevent you from graduating on time. P.T. school is similar to medical school in that



you enter with a class, and your class goes through everything together. You don't have any choice about what courses you take or when. You're in there for only two years, and the program is year-round, so if you fail a clinical, there's just no time to repeat it.

*Is there anything else you have to do to become a practicing physical therapist?*

Yes. After you graduate, you have to pass a licensure exam specific to the state you live in. Once you pass the exam, you're licensed in that state. If you want to practice in another state, you can apply for reciprocity, but some states require that you pass their exam.

*Did you find it easy to get a job after you passed the exam?*

Yes, and I consider myself very lucky. It's difficult for a recent graduate to get a job in pediatrics. Most of the people I know in this area have 25 or more years of experience.

*What does your job involve?*

At our center, we evaluate children ages birth through five in a multidisciplinary setting. In addition to a physical therapist, our staff includes an occupational therapist, a speech language pathologist, a pediatrician, a nutritionist, a social worker, an educational diagnostician, and a psychologist. We give the children a complete evaluation to determine if they qualify for any services from the school system.

I compare the gross motor abilities of the child I'm evaluating to those of a standard group of children—I expect to see a child walking by a certain age, for example. I also look for abnormalities of muscle tone, any strength or balance deficits, and overall quality of movement patterns.

*What kinds of cases are you working on?*

The kids I evaluate usually have some developmental delay. After evaluation, many of the children who come to our center are diagnosed with mental retardation, which involves global delays in all stages of development.

In addition to evaluating children with complex medical histories, I also treat some of these kids. Right now I'm working with a few children who have cerebral palsy and one who has spina bifida.

But where I work is a highly atypical setting for a physical therapist; most work in physical therapy clinics, rehab centers, or nursing homes—situations that involve more treatment than evaluation.

*Can you tell us about one of the children you're working with?*

I'm working with a boy who has cerebral palsy, and when I first saw him four months

wouldn't naturally assume because they're too weak. Through my handling, I can pose challenges to them, to their balance and muscle strength, and gradually get them to improve on those things.

For instance, I use a therapy ball to disturb this baby's balance. I sit him up and then move him to the left, and he struggles to straighten himself up. While this little bit of perturbation probably wouldn't be challenging to a normal infant of the same age, it's visibly difficult for this child. I just try to take him to the limit, where I'm pushing him a little bit, but still allowing him to be successful.



Photo courtesy of APTA

*Physical therapists can help developmentally disabled children become stronger by challenging them with positions they wouldn't naturally assume.*

*Do you find it challenging to work with developmentally disabled children?*

I do find it challenging to work with kids whose cases are so complex. I must continually evaluate what I'm doing and think about what I can do to make a difference for the child. I always have to ask myself if what I'm doing is effective; I always have to think about outcomes. It's demanding to examine everything I do on a daily basis.

But the setting I work in poses the greatest challenges. I have to make recommendations based on seeing a child one time, and what I say can have an enormous impact on the child.

Still, those challenges are nothing compared to the rewards. When I see a change—even the smallest change—I feel like I've made a difference. In

the case of the boy I was telling you about, I got to hear the excitement in his parents' voices when he sat up by himself the first time. Milestones that parents of normal children take for granted are miraculous for these parents. Every little step is a celebration, and it's incredible to be part of that. ■

ago, when he was about a year old, he couldn't really do anything. He couldn't even lie in a symmetrical position—he kept his head turned to one side and even had a bald spot from keeping his head turned in that direction. Now, I've worked with him to eliminate his head-turning preference, and he can even get into a sitting position by himself.

*How did you get him to do that?*

Because I can't exactly get babies to exercise, I have to put them in different positions that are challenging to them and make them work their muscles—positions they

**F**OR MORE INFORMATION ABOUT pursuing a career in physical therapy, visit the Web site of the American Physical Therapy Association at [www.apta.org/](http://www.apta.org/)

*The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one factor as you gather information and impressions from many sources.*

Our reviewers include thirteen students, who major(ed) in biomedical engineering (2), chemistry (2), communication disorders (1), computer engineering (2), English (1), history (1), math (2), mechanical engineering (2), and psychology (1). (The number of majors exceeds thirteen because one student had a double major.) Students' comments appear within quotation marks.

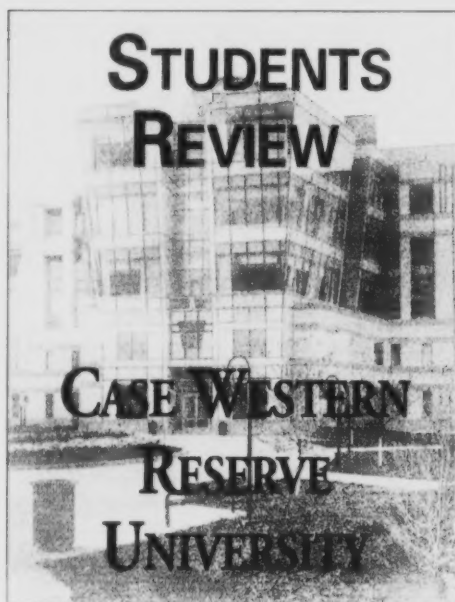
### Quality of Academic Instruction for Undergraduates

Reviewers praised the quality of the engineering education and the abundance of research opportunities Case offers its undergraduates. Several reviewers mentioned Case's dual-degree or Pre-Professional Scholars Programs, in which undergraduates in good standing may be accepted into Case's medical, law, or graduate programs without taking the MCAT, LSAT, or GRE.

"Case has one of the top-ranked engineering schools in the country and all the resources of a research institution. Several departments are corporate-endowed to assist with equipment costs. University Hospitals, a nationally recognized medical research facility, is just across the street. NASA's Lewis Research Center is also close enough that students work there during the year. A motivated student will find no shortage of research opportunities here."

"The highlight of my undergraduate career was how much I truly did learn. Even in huge classes (e.g., freshman chemistry, boasting some 400 students), the professors knew each student's name. I never had a problem reaching profs, and I never felt that I was taking up too much of their valuable time."

"The classes in my major, biomedical engineering, are challenging and fascinating. Classes are moderately to fast paced, with fairly heavy workloads. Class sizes for freshmen tend to be large, especially in the sciences, but after freshman year, they get a lot smaller. Upper level courses are, for the most



part, well structured and well taught, with a good balance between applied and theoretical approaches. The vast majority of courses are taught by professors rather than graduate TAs. Faculty are accessible if you make an effort; most keep regular office hours. If you do the work and stay cool on the exams, you'll survive. But you can't coast through school here."

"The core curriculum covers all the basics: three semesters of physics, two of chemistry, four of mathematics, one of computer science, one of English, and seven of social science. Case has a generous AP policy; many core requirements may be fulfilled with AP credits."

"Case's resources are tremendous. The school has excellent computer facilities, every room on campus is hardwired into the mainframe, and dorms have integrated services—Internet, phone, cable, etc. Case has an excellent library system. I was a chemistry and English double major with minors in dance, sports medicine, and biology. If I could find resources to meet all my needs, the resources must be diverse. Case also has a good record of success in graduate placement, especially for pre-medical and engineering students."

"Although Case has earned its reputation primarily as an engineering school, the non-engineering departments provide a variety of interesting courses. Specific departments whose teaching was praiseworthy include biochemistry, music, chemistry, and economics. But non-engineering offerings are spotty. Some subjects, like studio art, are not offered; others, like architecture, are offered only as a minor."

"Case offers a range of flexible dual degree programs. I'm in the Integrated Graduate Studies program for speech and language pathology. Because I came in with a bunch of AP credits and took my classes in a focused manner early on, I would have been able to graduate in three years except for one course. So I applied and was accepted into the IGS program. I am now finishing my undergraduate work and taking my first-year master's work during my senior year. I am listed by the university as a graduate student, but I have the benefit of keeping my undergraduate scholarship money."

### Social Life

"Extracurriculars and sports are not huge here. Computers are. If you're into late-night gaming and IRC, this is the place for you. There is, however, a lot more here than people give us credit for. Greek life is pretty active, and Case has a really good film society. Many of my friends sing or play instruments. Some are also involved in sports—and even the intercollegiate teams here will take anyone who's really interested. Several museums, coffeehouses, and the city's Botanical Gardens are within walking distance, and clubs and shopping are accessible by public transportation. Basically, if you want to have fun, you can; but you have to take the initiative. Personally, I like that I can easily turn off the social life when I need to."

"I was very happy with the social life at Case. Case has a thriving Greek system that includes 25–30% of the undergraduates. It was definitely easier to have a fulfilling social life as a member of a frat than as a dorm resident. Each frat/sorority has its own personality, but they're not exclusive and they're not at all like what you see in the movies—no hazing or wild parties. Non-Greek social life is much quieter; some students are commuters, while others are just not very social or choose to socialize via the Internet."

"The social life for computer geeks (like me) is incredible! One of the biggest events of the year is E-Week (Engineers Week), a mini olympics with all sorts of fun, team-based activities sponsored by campus engineering groups and visits from representatives of engineering firms."

"Cleveland can be a great place for someone ready to navigate an urban environment. The campus is situated in a cluster of academic, medical, and cultural

institutions, including several hospitals, Severance Hall (home of the world-class Cleveland Orchestra), Cleveland Art Museum, Natural History Museum, and Western Reserve Historical Society. University Circle, as the area is known, has its good and bad points. It's a very urban location, so student safety is an issue. On the other hand, so much is within walking distance of the campus, and the museums and symphony all offer reduced prices to Case students. There's a nice little bar right on campus and a very cozy branch of Arabica coffeehouse, which is a big social hub with poetry readings and games on the weekend."

"Cleveland is an up-and-coming city with a great live music scene. The Flats, a strip of restaurants and clubs in converted warehouses, are a fun place to go for dinner or dancing. Cleveland also has museums out the wazoo—several just off campus, as well as the Rock and Roll Hall of Fame and a new Science Museum—and is home to several pro sports teams."

### What Do You Like Best about Case?

The academic opportunities and atmosphere topped the list.

"The computer facilities are absolutely incredible, the undergraduate research opportunities considerable (leading to two publications in my case), and the students very nice as a rule."

"I love the small size; it's easy to get to know teachers and fellow students, yet it's large enough that you are always meeting new people. In some ways, it seems more like a small college than a university. Case's location in the middle of Cleveland keeps it from being too insular."

"The chance to get a very good education while maintaining a healthy balance between academic and social life. I gained a really good command of engineering principles and still had a lot of fun. And Case's on-campus recruiting attracts an excellent selection of companies. Many students graduate with jobs waiting for them."

"I'm finally around other people who share my interests. In high school, I was pretty much a straight-A geek. Here, most people are straight-A geeks—as well as being singers, dancers, athletes, whatever. It's nice to be in a place where everyone's smart."

### What Do You Like Least about Case?

"The standard complaint about any engineering curriculum: so many required courses. Most of Case's engineering programs leave students very few elective slots for courses outside the core and the major requirements. Many also require 130+ credits, which usually entails taking six courses for four out of eight semesters. Some people are unwilling to brave so many six-course semesters and instead take five years to finish their B.S. Others spend five years here so they have time to take courses in other subjects."

"Some people can be nerdy and antisocial."

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## CASE WESTERN RESERVE UNIVERSITY

Cleveland, Ohio 44106  
(216) 368-4450

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- 4-year private coed university
  - Urban campus
  - Full-time undergraduate enrollment 1998-99: 2,129 men; 1,480 women
  - Special features: The Pre-Professional Scholars Program, and an extensive co-op program.
- 

"The social life is perhaps the most common complaint. I was in a sorority, and that was a wonderful experience, but I would have liked more of my classmates to be involved socially. I also missed sports. Case is a Division III school, and there isn't much school spirit. Of course, this has its advantages: anyone can participate, and you don't have to worry about Case compromising its academics for sports!"

"The 2:1 male/female ratio. If you're a guy, this is not a happy thing. If you're a girl, this may sound okay, but there's a saying among Case women: 'The odds are good, but the goods are odd.'"

"Many faculty seem to regard you as a less serious student if you're not an engineer. When I decided that wasn't the path I wanted to take, I felt pretty much on my own in terms of advising."

### Who Would Be Most Compatible with the Academic and Social Atmosphere at Case?

"Hackers."

"Future engineers. If you love computers, Douglas Adams, Dilbert, Star Trek jokes, and role-playing games, this is a great place to meet kindred spirits. Starcraft battles are held regularly on the Case net. If you want a lot of campus social events, you might find the atmosphere a little underwhelming."

"Someone who believes the purpose of college is education above and beyond everything else. Case is full of intelligent, hard-working, motivated individuals."

### If You Had It to Do Over Again, Would You Go to Case?

Nine reviewers said yes, three maybe, and one no.

"Unquestionably. Case's Pre-Professional Program in medicine, biomedical engineering program, and scholarship program made their offer one I couldn't pass up."

"Yes. I was happy while at Case, and I have been very pleased with the career preparation I received there and the opportunities that came my way after graduation."

"Maybe. I had a great academic experience and met a lot of wonderful people, but I think a more supportive liberal arts college might have been a better match for someone like me who needed a few years of introspective general studies before settling into a vocational path."

"Probably not. I like Case and I love the friends I made there, but it's probably a little too straight-laced a place for me." ■

*As you try to find the school best suited to you, the views presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different school. At any college, it is important to seek out challenging academic experiences and to create a social life that fits your personal style.*

*Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or IAAY.*

# THE COACH'S CORNER

by Zuming Feng

We regret that the problems in the last issue contained typographical errors. The correct versions of all problems are listed below with their solutions.

**Zuming Feng** earned his Ph.D. in mathematics from The Johns Hopkins University. A mathematics teacher at Phillips Exeter Academy, Mr. Feng coaches the school's math team for participation in the AHSME, AIME, ARML, and the Mandelbrot Competition. In the summer, he is an instructor at the USA Math Olympiad Summer Program. You may send email to Mr. Feng at [zfeng@exeter.edu](mailto:zfeng@exeter.edu) if you have questions about these problems.

## Exercises

- [Ceva's Theorem] Let  $ABC$  be a triangle and let  $D, E, F$  be points on the lines  $BC, CA, AB$  respectively. Prove that the lines  $AD, BE, CF$  are concurrent if and only if  $\frac{BD}{DC} \cdot \frac{CE}{EA} \cdot \frac{AF}{FB} = 1$ .
- Let  $MNPQ$  be a convex quadrilateral with area 4. Prove that it is possible to find four points  $A, B, C, D$  within or on its perimeter such that each of  $[ABC], [BCD], [CDA], [DAB]$  is **greater** than 1.
- Let  $ABCD$  be a convex quadrilateral with inscribed circle  $\omega$  and let  $E, F, G, H$  be the points of tangency. Prove that the lines  $AC, BD, EG, FH$  are concurrent.

## Solutions to January/February Coach's Corner

- First we suppose that  $AD, BE$ , and  $CF$  are concurrent at  $P$  inside  $\triangle ABC$ . We have

$$\frac{BD}{DC} = \frac{[ABD]}{[ACD]} = \frac{[PBD]}{[PCD]} = \frac{[ABD] - [PBD]}{[ACD] - [PCD]} = \frac{[ABP]}{[APC]}$$

Similarly, we have

$$\frac{CE}{EA} = \frac{[BPC]}{[BPA]} \text{ and } \frac{AF}{FB} = \frac{[APC]}{[BPC]}$$

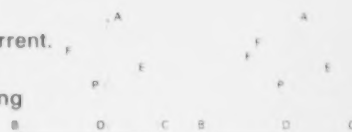
Thus

$$\frac{BD}{DC} \cdot \frac{CE}{EA} \cdot \frac{AF}{FB} = \frac{[ABP][BPC][APC]}{[APC][BPA][BPC]} = 1.$$

Now we suppose that  $\frac{BD}{DC} \cdot \frac{CE}{EA} \cdot \frac{AF}{FB} = 1$ . Suppose that  $AD$  meets  $BE$  at  $P$  inside  $\triangle ABC$ . Extend  $CP$  to meet segment  $AB$  at  $F'$ .

Then the first part implies that  $\frac{BD}{DC} \cdot \frac{CE}{EA} \cdot \frac{AF'}{F'B} = 1$ . Thus both  $F$  and  $F'$  are points on segment  $AB$  with  $\frac{AF}{FB} = \frac{AF'}{F'B}$ , which implies that  $F = F'$ , and  $AD, BE$ , and  $CF$  are concurrent.

From here, one can easily prove some general results: angle bisectors of a triangle are concurrent, the medians of a triangle are concurrent, the altitudes of a triangle are concurrent. Another useful version (trig. version) of the theorem is that the lines  $AD, BE$ , and  $CF$  are concurrent if and only if  $\sin DAB \sin EBC \sin FCA = \sin ABE \sin BCF \sin CAD$ . A proof using area ratios is left to the readers for an exercise.



- First we compare this problem with a very old problem.

Let  $MNPQ$  be a convex quadrilateral with area 4. Prove that it is possible to find four points  $A, B, C, D$  within or on its perimeter such that each of  $[ABC], [BCD], [CDA], [DAB]$  is **no less** than 1.

To solve this weaker version of the problem, we take the midpoints of all the sides to obtain a parallelogram of area 2 (why?). Any three of the vertices of the parallelogram determine a triangle with area 1.

Returning to the current problem, we see that a very slight change leads to a totally different and much more interesting problem.

WLOG, we suppose that  $[MNP] \leq [NPQ], [PQM], [QMN]$ . We will solve the problem in the following four cases:

- (1) When  $[MNP] > 1$ . In this case, simply let  $ABCD$  be  $MNPQ$ .

- (2) When  $[MNP] < 1$ . Since  $[PQM] > 3$ , if we let  $A = M, B = P, C = Q$ , and  $D$  be the centroid of  $\triangle ABP$ , all four triangles have areas greater than 1.

- (3) When  $[MNP] = 1$  and  $1 < [NPQ], [PQM], [QMN]$ . Since  $[MNQ] > [MNP]$ ,  $PQ \nparallel MN$  and the distance from  $Q$  to line  $MN$  is greater than that of  $P$  to line  $MN$ . Thus, for any point  $C \neq P$  on segment  $PQ$ ,  $[MNC] > [MNP] = 1$ . Now let  $M = A, N = B, Q = D$ ; we have  $[ABC] > 1$  and  $[DAB] = [QMN] > 1$ . Since  $[MQP]$  and  $[NPQ] > 1$ , applying the concept of continuum, we can always find a point  $C$  on segment  $QP$  close enough to  $P$  such that both  $[ABC] = [MNC] > 1$  and  $[BCD] = [CQN] > 1$ .





- (4) When  $[MNP] = [QMN] = 1$ . Since  $[MNP] + [PQM] = [NPQ] + [QMN]$ , in this case  $MNPQ$  is a trapezoid with  $MN \parallel PQ$  and  $PQ = 3MN$ .

Let  $A$  and  $B$  be points on  $MQ$  and  $NP$  respectively such that  $MA/AQ = NB/BP = 1/3$ . Let  $C = P$  and  $D = Q$ . Then:

$$AD = AQ = \frac{3MQ}{4}, AB = \frac{3MN + QP}{4} = \frac{3MN}{2}, \angle QMN = \angle QAB = \angle DAB.$$

$$\begin{aligned} \text{Thus } [ABC] &= [ABD] = \frac{AD \cdot AB \sin DAB}{2} \\ &= \frac{3MQ \cdot 3MN \sin QMN}{4 \cdot 2 \cdot 2} \\ &= \frac{MQ \cdot MN \sin QMN}{2} \cdot \frac{9}{8} \\ &= \frac{9}{8} > 1. \end{aligned}$$

We leave it for our readers to check that  $1 < [BCD]$  and  $[CDA]$ , which finishes our proof.

3. We first show that  $AC$ ,  $EG$ , and  $HF$  are concurrent. Then we can apply a similar procedure to show that  $BD$ ,  $EG$ , and  $HF$  are concurrent, which implies that  $AC$ ,  $BD$ ,  $EG$ , and  $HF$  are concurrent.

Suppose that  $AC \cap FH = M$ . Then:

$$[AHM] = \frac{AM \cdot HM \cdot \sin AMH}{2} = \frac{AH \cdot HM \cdot \sin AHM}{2};$$

$$[MFC] = \frac{FM \cdot CM \cdot \sin FMC}{2} = \frac{MF \cdot FC \cdot \sin MFC}{2}.$$

Thus

$$\frac{[AHM]}{[MFC]} = \frac{AM \cdot HM \cdot \sin AMH}{FM \cdot CM \cdot \sin FMC} = \frac{AH \cdot HM \cdot \sin AHM}{MF \cdot FC \cdot \sin MFC}.$$

$$\frac{AM \cdot \sin AMH}{CM \cdot \sin FMC} = \frac{AH \cdot \sin AHM}{FC \cdot \sin MFC}.$$

We also notice that  $\angle AMH = \angle FMC$  and  $\angle AHM + \angle MFC = 180^\circ$  (as the two angles take the values of half of the minor arc  $HF$  and major arc  $HF$  respectively). Thus,  $\sin AMH = \sin FMC$  and  $\sin AHM = \sin MFC$ , and

$$\frac{AM}{CM} = \frac{AH}{FC}.$$

Similarly, we suppose that  $AC \cap EG = M'$  and obtain that

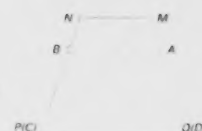
$$\frac{AM'}{CM'} = \frac{AE}{CG}.$$



Since both  $E$  and  $F$  are the points of tangency from  $A$  to the inscribed circle,  $AE = AH$  and  $CF = CG$ , which implies that

$$\frac{AM}{MC} = \frac{AM'}{CM'}.$$

i.e.,  $M = M'$ , and  $AC$ ,  $EG$ , and  $FH$  are concurrent.



### Solution to Word Wise

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M | A | R | D | I | G | R | A | S |   | S | E | R | B |   |   |
| A | R | C |   |   |   |   | T | O | T | E | M |   | T | A | O |
| Y | K |   | B | E | L |   | K | I | R | I | N |   | J | D |   |
| O |   | B | A | T | I | K |   | R | O | N | I | N |   | H |   |
|   |   | R | U | N | A | M | U | K |   | A | G | O |   | I |   |
|   |   | O | L | T |   | A | N | A |   | C | R | E | W |   | T |
| Z | U | L | U |   |   | G | O | S | P | E | L |   | P | R |   |
| E | G | S |   | G | I | F |   | H | O | T |   | S | I | E |   |
| I | E |   | L | A | G | U | N | A |   | S | A | N | E |   |   |
| T |   | M | I | N | G |   | E | L | F |   | T | U | T |   |   |
| G |   | A | L | E |   |   | T | O | R | N | A | D | O |   |   |
| E |   | P | A | S | H | A |   | M | A | O | R | I |   | L |   |
| I | P |   | C | H | A | R | D |   | U | N | S |   | V | U |   |
| S | A | D |   | A | M | A | N | A |   | Y | I | N |   |   |   |
| T | Z | A | R |   |   | B | A | R | M | I | T | Z | V | A |   |

More about...  
*Run Amok*

English speakers have adopted this colorful expression (which is more commonly spelled "amok") and use it rather broadly to refer to people or things that are disorganized or out of control. In Malaysia, however,

it has a very specific meaning: it's a kind of temporary insanity that strikes young men, who run around brandishing a sword, shouting "Amuk, amuk!" and attacking people. This and other culturally distinctive forms of aberrant behavior argue that mental illness includes a cultural component: people "go crazy" in ways that their culture recognizes as crazy.

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| Columbia (2#4)        | Swarthmore (3#4)                            |
| Cornell (5#1)         | University of California—<br>Berkeley (3#3) |
| Dartmouth (4#4)       | University of Chicago (4#3)                 |
| Duke (4#2)            | University of Michigan (2#2)                |
| Emory (6#2)           | University of Pennsylvania<br>(4#5)         |
| Harvard (3#1)         | University of Virginia (5#3)                |
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| Johns Hopkins (1#3)   | Williams (5#4)                              |
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# ImaGiNe...

*Last July, I was part of a group of 30 high schoolers and 10 adults sponsored by the Episcopal Diocese of Virginia to visit South Africa for three weeks. We stayed in Johannesburg, visited Sharpeville, went on safari, and ended our stay in beautiful Cape Town. During that time we did service projects at a school and a soup kitchen and made friends with South African young people. The trip broadened our horizons and was the most valuable experience of my life. This poem describes that experience.*

## GOD BLESS AFRICA

*by Rebekah Gottlob*

I left as an unbeliever on a mission trip  
With forty new friends on a thirteen-hour flight,  
More American than red-white-and-blue;  
Marvin's father was still in Mexico  
Emily and Katherine went to private boarding school  
Emmanuel was born in Nigeria  
Mark played the cello in a jazz band.  
We didn't know those stories yet.  
We learned them under the stars on a cricket field  
With the lights of Johannesburg on the horizon.  
The grass in South Africa smells different.  
Roses bloom even in the winter there.  
Everyone can sing and they dance in church.  
An Indian priest who ran a soup kitchen  
Didn't have any work for the boys:  
*Chopping vegetables is women's work.*  
We'd never heard a priest say that at home.  
We'd never seen one feeding starving children, either.  
As I got on the plane, I noticed that the moon was sideways.  
It takes fifteen hours to fly back across the Atlantic.  
I came back a missionary converted.  
In love with forty Americans  
And with South Africa. ■

*Rebekah Gottlob is a senior at William Monroe High School in Virginia, where she is captain of the Academic Team and active in debate. Next year she will attend St. John's College.*



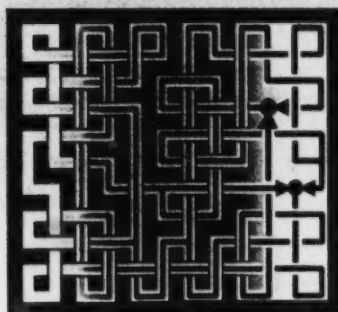
*View from a hill above Cape Town of the sun setting over the Atlantic*



*Some of the children we met in Sharpeville*



*Friends I made in Sebokeng where I spent the night with a local family*



# Knossos Games

by Tim Boester

A first-year graduate student in mathematics at the University of Wisconsin, **Tim Boester** now has additional puzzles on his home page:

[www.math.wisc.edu/~boester](http://www.math.wisc.edu/~boester)



## A Primer on Unusually Ordered Sets

The number systems we normally deal with are well ordered; that is, we may compare any two numbers in the set to one another. However, sets can be ordered in other ways. In a *partially ordered set*, we can compare a given number only to *some* of the other numbers in the set, according to the rules of that set. For example, in a partially ordered set in which only numbers with the same number of digits may be compared, we could say that 2 is less than 3 and that 12 is less than 22, but not that 7 is less than 12. Those last two numbers simply cannot be compared because they do not have the same number of digits.

This puzzle is based on a more complicated ordering of a set, in which numbers may be compared with numbers that have not only the same number of digits ( $n$ ) but also  $n+1$  or  $n-1$  digits.

### The Goal:

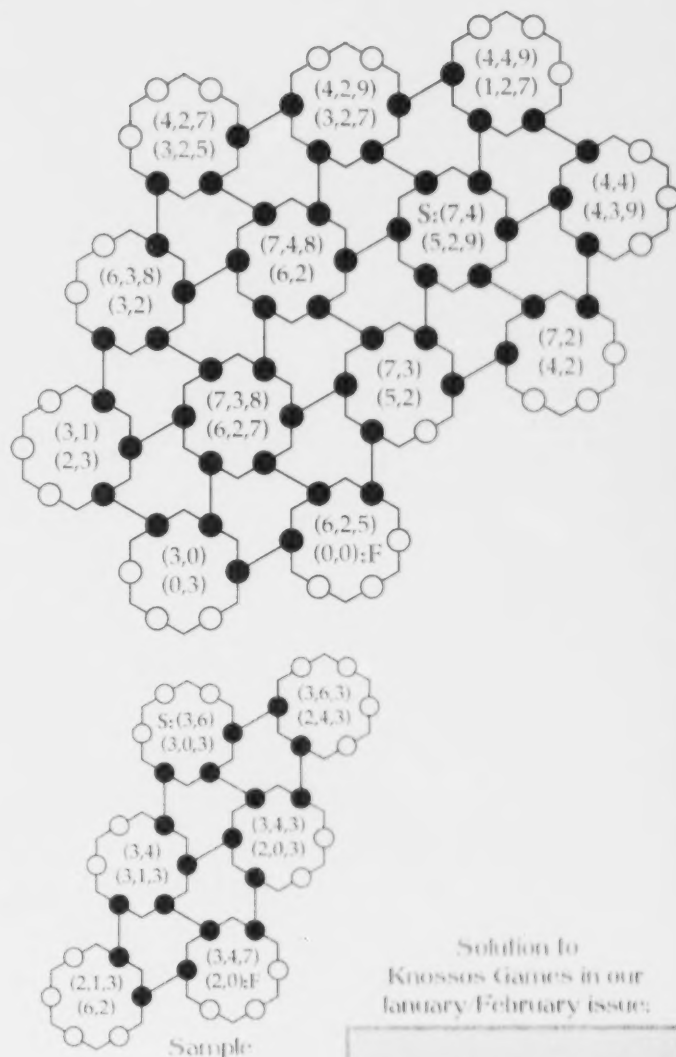
Move from hexagon to hexagon, starting with the "number" marked S and ending with the "number" marked F.

### The Rules:

1. You may move between "numbers" with the same number of digits if one and only one digit is lower in the second "number." Example: You may move from (3,7) to (3,6) or (2,7) but not from (3,7) to (2,6) or (3,8). You may move from (3,7,2) to (3,6,2) but not to (3,6,1).
2. You may move from a 2- to a 3-digit "number" only if the first two digits are the same in the two "numbers." Example: You may move from (3,2) to (3,2,7) but not to (3,7,2).
3. You may move from a 3- to a 2-digit "number" if one of the first two digits is the same in the two "numbers" and the other of the first two digits is lower in the second "number." Example: You may move from (4,6,2) to (4,5) or (3,6) but not to (4,6), (4,7), or (5,6).
4. The first time you land on a hexagon, use the top "number" in the hexagon. If you revisit the hexagon, use the bottom "number."

Confused? Here's the solution to the small example, to help you get the feel of moving according to these rules:

S:(3,6) – (3,4) – (3,4,7) – (3,4,3) – (3,1,3) – (2,1,3) – (2,0):F



Solution to  
Knossos Games in our  
January/February issue:

|    |    |    |    |
|----|----|----|----|
| 10 | 5  | 9  | 8  |
| 3  | 12 | 14 | 4  |
| 16 | 6  | 1  | 11 |
| 15 | 13 | 2  | 7  |

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VOLUME 6 • NUMBER 5

Opportunities and Resources for Academically Talented Youth

May/June 1999

**SPOTLIGHT  
CAREER D**

**of the Law**

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**An Outward Bound Adv**

**Students Review W**

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## Focus On: Career Discovery

AS THE WORLD CHANGES, SO DO CAREERS. SOME OF THE FASTEST-GROWING professions didn't exist 20 years ago. While we cannot fully predict how technological and economic developments will affect the professional landscape, one thing is clear: there are many career paths a young, talented individual can take. But how do you choose one?

Don't wait until senior year of college to discover a career that would be perfect for you if only you'd majored in biology or journalism or physics. High school is the time to start exploring career options. Knowing what careers are available and interesting to you can help you make smart decisions now, whether you're choosing course work or applying to college.

This issue of *Imagine* highlights many ways to discover your dream career, from job shadowing to interning. And you'll hear from young people at different points in their career decision-making: A middle school student describes a summer mentorship experience, a high school senior explains how a student organization has honed his professional skills, and several young doctors and lawyers discuss their specialties and why they chose them. Of course, we can't tell you which careers are best for you. But this issue will help you start heading in the right direction. ■

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*Imagine*...

*Opportunities and Resources for Academically Talented Youth*

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*On the cover: Camille Garcia, a participant in the Internship Program at NASA Glenn Research Center, and her mentor, Robert Jones.*

*Photo courtesy of NASA Glenn Research Center.*

# CONSIDER THE POSSIBILITIES:

## Finding a Career That's Right for You

by Carol Blackburn

*I'm fascinated by the Human Genome Project. It's going to change so many things in our lives—medicine, of course, but also the way we look at ourselves, our dreams, our laws, our fears. It's all so interesting, and I want to be part of it, but I just don't know what part.*

—Eve, high school junior

Eve is wise to be thinking beyond *what* she likes to *how* she might want to be involved. In school, the world may be divided into academic subjects; but in real life, such arbitrary divisions become less meaningful. Instead, the *approach* Eve takes in pursuing her interests will be as relevant as the interests themselves. Is Eve more of an explorer or an explainer? Analyst or artist?

If she's an explorer at heart, she might become a researcher who deciphers uncharted expanses of DNA. If she's more of an explainer, she might opt for a career as a teacher or science journalist who shares her excitement about the latest HGP developments with others. If she's an inveterate analyzer, she might enjoy being a biomedical ethicist who ponders the social and philosophical ramifications of our newfound capabilities, or a businesswoman on the prowl for promising biotech investments. If she longs to express herself artistically, she might dream up stories that dramatize new opportunities and dilemmas created by genetic engineering.

These are only a few of the possibilities open to Eve, all of which would allow her to pursue a fascination with the HGP. How is she to choose?

Choosing a career involves trying to match the complex puzzle piece that is you with the complex world of career opportunities. In this two-way matching process, you need to look at both sides of the

puzzle: 1) how well you could satisfy the demands of a given career, and 2) how well a career might satisfy your interests, goals, and values.

### What Makes You Special?

Your ability to fulfill the demands of a career may not be much of a limiting factor. You may be able enough in a range of areas to succeed in many careers. However, even highly able students have relative strengths and weaknesses.

Many of us take our personal strengths so much for granted that we're unaware of how unusual or valuable they may be. You may brush aside compliments, saying to yourself, "People say I'm a good writer, but everyone can write, can't they?"

Objective assessments can help reinforce or expand what you know about yourself. Your performance in school, on standardized tests, and in academic extracurricular activities can provide indications of your abilities relative to those of others. All can help you identify some of your greatest academic strengths and give you a better appreciation of what you have to offer.

Of course, not all abilities are academic, nor can they all be assessed objectively. Are you a good explainer? Organizer? Morale booster? Troubleshooter? Here's where you can benefit from feedback from people who know your work, either in school or in extracurricular activities. Listen to what they have to say; you may not be the best judge of your abilities in things that may come quite naturally to you. Yet these sorts of abilities are likely to play at least as large a role in your career success as will your intellectual abilities, because different careers demand different personal characteristics.

Personality "tests" can also help you clarify your natural tendencies and preferences. Are you more likely to approach situations coolly and analytically or compassionately and caringly? Do you prefer orderly or

improvisational settings? A caring, orderly person might be good at mediating or maintaining civility in a group, while an analytical, improvisational person might enjoy troubleshooting. By highlighting such aptitudes, personality tests can give you a clearer picture of your character strengths and the kinds of roles you might enjoy and be good at.

### What Do You Really Want?

Before you can decide how well a career might satisfy your needs and desires, you need to know what they are. Sometimes the hardest part of solving the career puzzle is deciding what you really want.

What's important to you? Having responsibility? Financial security? Flexibility? Competitive excitement? A chance to put your spiritual values to work in the world? Creative self-expression? These are only a few of the characteristics people may desire or value in a career.

One young engineer struggling with this challenge joked, "I haven't quite perfected my decision-making algorithm. I'm still trying to determine the relative values for all of the coefficients in the equation." While most of us would not describe the process quite so mathematically, his comment captures a truth: choosing a career does involve many considerations, and only you can decide how much weight to give each of them. No one else can write your personal decision-making algorithm for you.

Highly able individuals often consider intellectual challenge to be an important factor, but it's not always the paramount one. One mathematically gifted young man who decided to spend his life helping politicians try to balance the budget summarized his choice in this way:

*"I feel that I'm using my skills to do something worthwhile—to play a direct role in improving the society around me. My work is perhaps less intellectually rewarding than an*

*Continued on next page*

*academic career might have been, but it's more personally rewarding—and challenging. I have to learn to combine my intellectual abilities with social skills to convince people to make changes in public policies. Compared with changing someone's mind, proving a theorem is a piece of cake."*

For him, playing a direct role in improving society was more important than maximizing the intellectual challenge his job would offer him. Someone else with the same abilities but a strong desire to see and touch the fruits of her labors might choose engineering or architecture over math. Another mathlete, who thrives on adventure and adrenaline, might choose the high-stakes life of a Wall Street investor. All three might have the same raw intellectual abilities, but their different priorities pull them in very different directions.

Ideally, your career will allow you to express many aspects of yourself. Deciding which ones are most important to you is a highly individual process. But the benefit of such self-scrutiny is greater clarity as you make important choices.

### What's It Really Like?

You can't possibly know how well a career would satisfy your goals and desires and interests unless you know what that career is really like. You may think you know, from books you've read or movies you've seen, but you owe it to yourself to reality-test your impressions before making any major decisions. You may find it much easier to choose among careers once you're more familiar with the worlds that come along with them.

In the careers you're considering, find out how much of your day might be spent alone, how much working with others, how much in committee meetings. What kinds of people would you spend your days with? Would they be likely to share your values and goals? Would your days be fairly predictable or full of surprises? Would your calendar be fully booked weeks in advance or would your daily schedule be flexible? Would projects take hours, weeks, or years to complete? Would you have to learn a lot of new material every few months, or would much of your learning be concentrated in a training period or graduate program? And which of these factors would make a difference to you in your job satisfaction?

Explore. Talk to people working in the careers that interest you. Get some personal experience. This is where shadowing and internships come in, allowing you to enter into a professional world. Walk a mile—or at least a few steps—in the shoes you're considering wearing for the rest of your life. See if you truly enjoy the life of a doctor or lawyer or journalist. Remember, too, that every profession includes many niches, some that might suit you better than others. The life of a surgeon is quite different from that of a pediatrician or a pathologist. Get to know the range of opportunities a profession has to offer.

Trying out a career can confirm its suitability for you—or, just as importantly, rule it out. After working in a lab, one aspiring scientist found that "nothing is more exciting than planning an experiment, conducting it, and getting a result, whether

**Choosing a career involves trying to match the complex puzzle piece that is you with the complex world of career opportunities.**

expected or not" and decided to pursue a Ph.D. Another concluded that "I wasn't cut out for a life in the lab. The work was—for me—frustrating, confusing, and tedious" and headed for a career in medicine instead.

No matter how engaging you find the subject matter at the heart of a career, if you don't also enjoy the day-to-day life, you won't be as happy as you would be in a career where you relish both the subject matter *and* the daily life.

### What Will the Future Bring?

You will continue to evolve, and so will the world. In our rapidly changing technological society, continued professional success is inextricably linked to continued learning. Given the exciting (and unavoidable) fact that you will forever be learning new things and developing new skills no matter what career you choose, it's worth thinking about the kinds of long-term growth you would like your career to foster.

Think big. Try, as much as possible, to leave the door open to possibilities you might want to pursue. Consider the breadth of opportunity that a particular training or work experience might afford you later on. As one grad student put it:

*"I opted for a Ph.D. in economics rather than math because economics gives me more latitude to pursue a wide range of interests. If, in the future, I decide to work on economic policies concerning the environment, my training will accommodate that. My interests in math, on the other hand, are a much smaller proportion of 'all the things in life that interest me.' That was the deciding factor for me: that economics is a widely applicable career for someone who has both technical interests and a good dose of curiosity regarding social and public policy issues."*

As you explore careers and talk to people about their lives and their work, notice which aspects of themselves their work has encouraged or enabled them to cultivate. And try to think ahead to your own evolution.

### Coming of Age in the 21st Century

Each of us comes of age at a particular time and place in history, within a particular culture and even subculture. As you talk with people about their careers and learn about the lives of people you admire, remember that your moment in history presents you with different opportunities than those open to your parents or heroes.

Learning about the physicists of the early 20th century might, for example, inspire you to become a physicist. But things have changed since the days of Einstein and Schrödinger. When you examine *your* opportunities, you may find that the life of a 21st-century physicist isn't quite as appealing an option as some other careers—most of which didn't even exist a century ago!

A world of possibilities awaits you. Explore it. And explore the puzzle piece that is you. The better you know yourself and your options, and the more your self-understanding informs your career decision-making, the better you'll be able to create a life that engages and rewards what you value most in yourself. 17



**W**hat will you be doing when you've finished college? Some of you can probably answer that question without even thinking about it. Perhaps you see yourself explicating a literary text to a classroom of undergrads, performing a life-saving surgery, or developing the next sensational video game. Or maybe your answer to that question is simply, "I have no idea."

*Whether you know what career you intend to pursue, have only a vague idea of what you might like to do, or have decided not to decide until you absolutely have to, you can benefit from investigating a variety of potential careers during your precollege years. You might discover fields you hadn't considered, for example, or learn that your dream job requires more training or travel or administrative tasks than you thought. What you learn could even influence your choice of college and major.*

*The activities described on the following pages can help you clarify your career goals, no matter how far along you are in your planning. Arranged by duration and degree of commitment, these activities range in the amount of structure and type of experience they offer. All provide interaction with established professionals, the opportunity to make contacts, and a glimpse of what's possible for you in your professional future.*

# WHAT'S YOUR LINE?

## How to Learn About Careers Now

### CAREER DAYS

#### What are they?

Businesses, organizations, or institutions invite students to learn about careers in their respective areas. Unlike job fairs, which are intended to recruit professionals for specific positions, career days provide information about professions in general. Varying in format from panel discussions to individual booths, career days provide an overview of a field or fields.

#### Advantages

- You might be able to learn about more than one career in a single day.
- You can learn about an area you'd like to explore in more depth later through shadowing, an internship, or a mentorship.
- You will probably have the chance to ask specific questions about the professions that interest you.
- You will learn the names of professionals you might decide to contact later for more information.

#### Get involved

- The Institute for the Academic Advancement of Youth sponsors Career Symposia for Johns Hopkins Talent Search participants. Call (410) 516-0076 or visit [www.jhu.edu/~gifted/ts/tsops.html](http://www.jhu.edu/~gifted/ts/tsops.html) for more information.
- The Center for Talent Development at Northwestern University holds a one-day career conference for academically talented students. Call (847) 467-4283 or visit [www.nwu.edu/ctd/programs/parent97.html](http://www.nwu.edu/ctd/programs/parent97.html) for more information.
- Look in your community. Many museums, zoos, and aquariums hold career-related events, as do community colleges.
- If your school doesn't already sponsor a Career Day, consider organizing one. Parents and other community members



will probably be more than willing to share information about their careers with interested students.

### JOB SHADOWING

*When I shadowed a professional engineer at NASA, I especially enjoyed learning about computers and other types of technology as well as the field of engineering in general. I even got to have lunch with the engineer I shadowed. Just sitting down and talking with this person who shared my career ideas made the whole day worthwhile. He offered advice about college and told me about many of the different careers in engineering.*

—Heriberto "Eddie" De Jesus,  
South High School, Cleveland

*Continued on next page*

## What is it?

A student accompanies a professional through all activities of his or her workday. Although students do not usually participate in these activities, they have the opportunity to observe the range of tasks that make up a typical day in a given profession.

## Advantages

- ☐ Since shadow experiences last for only a day or at most a few days, you can learn about several careers without much time commitment. (Summer is a great time to shadow!)
- ☐ You can establish important connections with not only the person you shadow but also others who work with him or her. These contacts could lead to a future mentorship or internship.
- ☐ You may be able to spend part of your day interviewing the person you shadow to learn even more about the profession.
- ☐ Because you are there to observe and not to do, you will probably have the opportunity to see a lot of highly skilled work.
- ☐ You will gain a good sense of the work environment, such as whether it's fast- or slow-paced, whether the job involves a lot of interaction with other employees or the public, whether the atmosphere is casual or more professional.
- ☐ If you're undecided about a career, shadowing can help you pare down the list of careers you might be interested in.

## Get involved

- ☐ The student quoted above participated in the Shadowing Program at NASA Glenn Research Center. See [www.grc.nasa.gov/WWW/OEP](http://www.grc.nasa.gov/WWW/OEP) for details about this program. NASA also offers shadowing opportunities at Goddard Space Flight Center in addition to numerous other career exploration activities. For more information, see [ehb2.gsfc.nasa.gov/edcats/1999/nep/programs/index.html](http://ehb2.gsfc.nasa.gov/edcats/1999/nep/programs/index.html)
- ☐ If your school doesn't participate in Groundhog Job Shadow Day, see if you can get the program going in your school



*time as a reporter was rewarding, and fun in some ways, it also demonstrated to me that reporting was probably not a profession I could really fall in love with. At the same time, my work with protein chemistry in a lab in Boston this past summer allowed me to explore the possibility of being a medical researcher, and the field has me quite thoroughly smitten. Internships are a great way to learn more about yourself and what you will or won't want to dedicate your time and energy to in the future.*

—Jeremy England,  
Phillips Exeter Academy

## What are they?

Internships place students in a professional setting for lengths of time ranging from a few weeks to a full semester or more.

Some interns are paid or receive credit for their work; others receive no compensation. Structures of internships vary widely: some internships require students to perform specific tasks on an established project, while others allow students great flexibility in choosing projects. Similarly, interns' tasks range from answering phones and running errands to performing research and setting up computer networks. Clearly, students should choose their internships carefully.

## Advantages

- ☐ Internships provide access to work experience not normally available to high school students.
- ☐ The experience you gain can make you an attractive college or job applicant. Occasionally, internships lead to full-time jobs.
- ☐ Because you'll actually participate in the work environment, you'll be able to tell how well the job matches your personality and goals. This makes internships especially valuable to those who have already narrowed their list of potential careers.
- ☐ You'll develop important professional contacts and perhaps develop a relationship with a mentor.

for February 2, 2000. GUSD seeks to place kids in the workplace to shadow an employee for the day. For more information, visit [www.jobshadow.org](http://www.jobshadow.org) or call (410) 810-7910.

- ☐ Ask your network of family and friends. You might have relatives in a field you're interested in, or friends who have parents with fascinating jobs. If they can't host you for a day, they might know someone else who can.
- ☐ Check with your school's guidance office, and call local businesses, hospitals, and museums.
- ☐ If a career you want to learn about isn't represented in your community, try contacting the relevant professional organization (see pages 20–21).

## INTERNSHIPS

*Internships are certainly valuable for exploring what you might want to do with the rest of your life, but they are also priceless for discovering what you don't want to do. Two summers ago, I was enamored of journalism and thought I might learn more about it at a local newspaper. While my*

## Get involved

- Browse through the books listed below, or contact the organizations listed on pages 20–21 to inquire about internship opportunities.
- Check with your guidance office or gifted education coordinator to learn about internship opportunities in your community. New and small businesses as well as state and local institutions often accept high-school-age interns.
- If the organization that interests you does not offer internships, consider taking a volunteer position. While these positions may not provide the same responsibilities as an internship, you can learn a lot if you are diligent and proactive, and you can make important connections that might lead to an internship or mentorship.

## Selected internship resources

Green, Marianne Ehrlich. *Internship Success*. Chicago: VGM Career Horizons, 1997. (\$12.95)

Oldman, Mark, and Samer Hamadeh. *America's Top Internships*. Princeton Review, 1998. (\$21.00)

—. *The Internship Bible*. Princeton Review, 1998. (\$25.00)

Peterson's *Internships 1999*. Princeton: Peterson's Guides, 1998. (\$24.95)

## MENTORSHIPS

*I had originally entered into a mentorship to learn computer graphics. However, I learned even more when my mentor suggested readings from the book *The Mind's I* by Douglas Hofstadter and Daniel Dennett. As time went on, the readings—which grew to include *Gödel, Escher, Bach: An Eternal Golden Braid* and *Fluid Concepts and Creative Analogies* by Hofstadter and *The Symbolic Species* by Terrence Deacon—became the focus of the mentorship. Even though we didn't perform new research or experiments, the mentorship was valuable because it allowed me to learn about and discuss new ideas in a friendly atmosphere with people who often had very different viewpoints.*

—Jill Sison, Illinois Mathematics and Science Academy

## What are they?

A mentorship pairs a student with a professional sponsor who is committed to contributing to that student's development. Most aspects of the mentorship are determined by the student and the mentor; they may be long- or short-term, for example, or involve either a specific project or a more general exposure to the mentor's profession. Mentorships require a serious commitment on the part of both the student and the mentor.

## Advantages

- You may be able to perform highly-skilled work under your mentor's guidance.
- Because they require commitment and responsibility, mentorships can lead to greater maturity and self-confidence.
- You will get to know more than just a profession—you'll also learn a lot about the people who choose that profession. Your mentor might even agree to a personal interview about his or her specific career-related experiences.
- Your mentor will be a valuable professional contact when you're ready to enter the field.

## Get involved

- Cultivate connections you formed through shadowing or interning. Even if the people you worked with aren't possible mentors, they might know someone who could be.



- Check with your school's guidance department, and call local businesses, labs, hospitals, and universities to learn about existing programs or employees who might be potential mentors.
- The Mentor Connection in Minnesota not only pairs high school students with mentors but also conducts a guidance lab that teaches the students about decision making, self-awareness, and career awareness. If your school or community doesn't offer a similar program, you might be able to get one started. For information, contact Jeanie Davis Pullen, The Mentor Connection, Northeast Metro 916, 3300 Century Avenue North, White Bear Lake, MN 55110; (651) 415-5454.
- Check out Hewlett Packard's Telementor Program, which facilitates e-mail relationships between interested students and HP employees. You must work with a teacher, who must be approved before you submit your application. For more information, see [www.telementor.org/hp/](http://www.telementor.org/hp/)

## For more career information, see these books and Web sites:

Harkavy, Michael David.

*101 Careers: A Guide to the Fastest-Growing Opportunities, Second Edition*. John Wiley & Sons, 1998. (\$16.95)

Landes, Michael. *The Back Door Guide to Short Term Job Adventures*. Ten Speed Press, 1997. (\$21.95)

### Career Center for Teens

[www.pbs.org/jobs/teenindex.html](http://www.pbs.org/jobs/teenindex.html)

### Career Exploration:

**The Personal Side of Work**  
[www.jobprofiles.com/](http://www.jobprofiles.com/)

### Career Exploration Web Resources

[www.jhu.edu/gifted/set/careers.html](http://www.jhu.edu/gifted/set/careers.html)

### FutureScan: Careers for Teens

[www.futurescan.com/realworld.html](http://www.futurescan.com/realworld.html)

# The Mentorship Experience

## Interview with Ann Dell, Ph.D.

by Melissa Hartman

*Ann Dell is the mentorship coordinator at the Oklahoma School of Science and Mathematics (OSSM). This two-year residential public high school was created to meet the academic needs of Oklahoma students who are talented in mathematics and science.*

*Why does OSSM have a mentorship program?*

The mentorship program was developed—right along with the curriculum—when OSSM was in the planning stages. We saw it as an integral experience that we could offer our students. Mentorships give students an advantage when they go to college. They already know what scientists or engineers really do in their daily work, and this helps in deciding on courses and a career path.

But we don't *require* students to do mentorships. A mentorship here is a privilege, and usually only seniors in good academic standing are allowed to do them. The students who participate are highly motivated and are ready for a "real-world" experience.

*How do you ensure a good fit between student and mentor?*

The students fill out an application form that describes their primary interests and goals. Some students are very clear about what they want, so I compare their interests with my master list of possible mentors. If students are unsure about a field of interest, I talk to them and try to draw out what they really like to do.

I consider the personality fit between the student and mentor to be as important as the project the two will work on. Some mentors are more nurturing than others, so I would match them with students who need a little more guidance or are very shy. Other mentors work at a very fast pace and expect the student to fit in. I would place a student who has a lot of self-confidence in that environment.

*Besides specific skills from the workplace, what do mentors teach your students?*

I have a few mentors whom I consider "mentors from heaven." One is a biomedical scientist who has incredible skill at evaluating what each student is especially good at. She discusses with them what their skills are (bench science vs. data analysis, for example) and what they're not so good at. She's very frank, but never demeaning. She gives them advice about college, careers, or anything else they want to talk about.

**Mentorships give students an advantage when they go to college. They already know what scientists or engineers really do in their daily work, and this helps in deciding on courses and a career path.**

Another mentor from heaven is an architect at the local office of a national architectural firm. He shows by example how to dress professionally, how to interact with colleagues, and most importantly of all, he teaches students how to access their own creativity.

The best of my mentors usually stay in touch with students for several years after the experience. These mentors give career advice and counseling, and help the student network with established professionals at other institutions.

*How do students respond to the experience?*

Most students *love* their mentorship experience. Some are surprised to find that they can actually use what they have learned in their classes, that their teachers have taught the very concepts needed in an

engineering or biomedical mentorship. Our students find that their computer and math skills put them ahead of others—even graduate students—in the lab.

*Do you have any particularly memorable mentorship success stories?*

In one case, the chair of a biomedical science department at a local college of medicine reluctantly agreed to take a student, so I sent her to meet with him. She came back from that first meeting absolutely ecstatic—she had been allowed to do surgery on an anesthetized rat on the first day. In turn, her mentor could not say enough good things about her. The results of her initial work were good enough that her mentor wrote a grant proposal to do more experiments. She then worked in his lab for two or three summers during her college years.

*Many of our readers attend schools that don't have a mentorship coordinator. How might these students find a mentor?*

Basically, the student could do what I do to find mentors: call people and ask for help. If the person I am speaking with can't help me, I ask them for information on other people who can. So the student might ask teachers or friends if they know someone who works in a research or technology environment. That contact person may be able to point the student toward a mentor.

*Why would you recommend a mentorship to our readers?*

A mentorship puts students in touch with the "movers and shakers" in the real world. I hope that, helped by their mentorship experiences, my students can move from high school into a community of scholars in college or in the business, technological, or professional world. I believe that a mentorship moves them beyond the narrow range of their books into a broader world where their talents will be appreciated and used. ■



# A Middle-Schooler at NASA

by Weiting Xu

**A**lthough many students are intrigued by the work at NASA, very few actually experience it. But last summer, when I was in eighth grade, I had the opportunity to intern at NASA under the guidance of a mentor.

## Just by Taking the SAT ...

It all started in 7th grade, when I took the SAT as part of the Johns Hopkins Talent Search. Because I earned a high score, I was awarded a one-course scholarship at The College of William & Mary, which I used to take a calculus course. Since it was my first college class, I was nervous about the demanding material and my older classmates. But my teacher, Professor Craig Hunter, soon put me at ease. He went out of his way to help the students learn and make calculus fun.

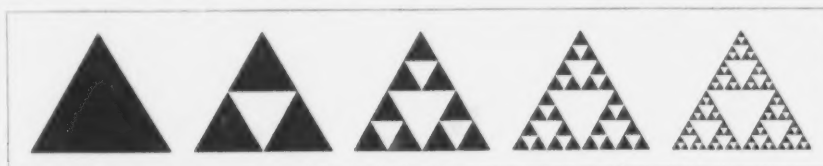
I soon learned that Professor Hunter was also an aerospace engineer at the NASA Langley Research Center. To expose us to applied mathematics, he often gave examples from his research, including his favorite subject, chaos. By reading James Gleick's *Chaos*, doing experiments, and writing essays on the topic, I discovered that chaos is found everywhere—in the weather, our brain activities, the shapes of trees, and the drips of leaky faucets. I was intrigued and wanted to continue exploring it.

When the semester ended, I told Professor Hunter that I wanted to learn more about chaos. He suggested that I apply for NASA's volunteer program, which places students with mentors to learn new subjects. But the program requires that applicants be at least high school juniors. Since I didn't meet that requirement, the director of the program made special arrangements through Professor Hunter, who kindly agreed to be my mentor. I worked three to four days a week and eight hours a day at NASA. Under Professor

Hunter's guidance, I completed several computer simulations that took me further into the world of chaos.

## Modeling Chaos on the Computer

During our study of chaos, we modeled a Sierpinski Gasket and a fern. In a Sierpinski Gasket, the sides of an equilateral triangle are bisected; then these points are connected and the triangle they form "cut out," leaving three equilateral triangles. The procedure is repeated on the three new triangles and on every newly formed triangle thereafter.



The Sierpinski Gasket is a fractal created by connecting the midpoints of the sides of an equilateral triangle "removing" the center triangle and then repeating the process on the three newly formed triangles and every newly formed triangle thereafter.

To model the Sierpinski Gasket, Professor Hunter helped me develop a computer program that randomly generates three numbers, say 1, 2, and 3, representing the three points of an equilateral triangle. It also generates an arbitrary starting point outside the triangle, say point 0. Then, halfway between point 0 and the numbered point already generated, another point is drawn. This becomes a new starting point, and another point is drawn using the same process. As more points appear, the image of the gasket becomes clearer. The model of a fern is similar; but instead of triangles, random points are drawn to form a stem or the top, right, and left sides of the fern.

But the most interesting project we undertook involved creating a model of cigarette smoke. Smoke steadily rises in a ribbon, but at a certain point it becomes chaotic. Our task was to use a computer to re-create an environment and simulate the chaotic movement of cigarette smoke. First, we worked out functional

relationships between the variables, and then solved the dynamic system of equations. After we had the solution, we wrote a simulation program.

The programming itself proved to be one of the most challenging aspects of the project. At first, the simulated smoke would vanish without any chaotic movement. Later, as we explored different values of the parameters, the chaotic outcome started to appear. It took many tries before we finally got the program working. When the parameters reached certain critical values, we could see one of the most important characteristics of chaotic behavior take shape: a minute change in the initial conditions produced an explosive change in the pattern of the smoke. It was fascinating to observe the movements of the smoke and see where it turned chaotic.

**T**hanks to this experience at the NASA Langley Research Center, I have come to enjoy mathematics and to appreciate computer technology. But the most important lesson I have learned is the value of working with a mentor. Professor Hunter showed great concern for my education and development, and by working with him, I have learned not only how fascinating computer technology and math can be, but also the importance of diligence and responsibility. Working at NASA also exposed me to various career choices, such as engineering and computer graphics, and I have a renewed zest for learning because of it. ■

Last summer was eventful for Weiting Xu who not only worked at NASA but also volunteered as a costumed interpreter at Colonial Williamsburg. During the school year, she enjoys tennis and playing aboe in the High School Symphonic Band.



# The Wide World

*The doctors we know or see on TV give us a somewhat narrow view of what is one of the most challenging and varied professional fields. Not all doctors wear white coats or even work with patients. Each medical specialty involves a unique set of tasks performed in a unique setting.*

*Below, six very different writers share their experiences in medical specialties ranging from research to pediatrics. Whether they prefer working with patients or spending most of their time in a lab, these doctors have all found satisfying ways to improve the lives and health of others.*

## Pediatrics

by Scott Needle, M.D.

**D**o you like imitating Elmo and Cookie Monster? Do you know what Banjo-Kazooie is? Would you be willing to accept being peed upon as an occupational hazard? If so, an exciting career in pediatrics might be for you.

Good pediatricians tend to be easy-going. They shun the white coat unless they need extra pockets. They don't mind getting down on their knees to talk to a kid. When children are the center of attention, everything—including you—must come to *their* level.

I entered pediatrics not only because I liked children, but also because I like its driving philosophy. Pediatrics emphasizes caring for the future: making the influences or changes now that will have a positive impact on the rest of a child's life. That focus carries through all aspects and subspecialties of pediatrics. I am particularly interested in public health, which often revolves around children's issues. By working to advance immunization and health education programs, improve health insurance, and prevent adolescent violence and pregnancy, I can help children across an entire community, even the ones who never enter my office.

As a primary care pediatrician, I see plenty of runny noses and sore throats, but I also encounter chronic illnesses and diagnostic dilemmas. Even the most basic and commonplace problems, such as fever and ear infection, present academic challenges

and opportunities for patient education as new studies overthrow the status quo.

Pediatricians may be among the happiest (and friendliest) doctors. When you're around kids all day, you have to be. I enjoy my work, I enjoy my patients, I enjoy the challenges, and most of all, I enjoy making the differences that can last a lifetime. ■

Scott Needle is currently finishing his residency at

New England Medical Center in Boston and will enter into private practice in St. Petersburg, FL, in July.

If you'd like to learn more about pediatrics, you may

contact him by email: [ZoogyBear@aol.com](mailto:ZoogyBear@aol.com)



## Genetic Research

by Jacqueline Lopez, Ph.D.

**W**hen I come home from the lab, my three-year-old often asks, "Mommy! Did you squish the buggies today?" "No," I say, "today I spent ten hours sorting the yellow-bodied flies from the normal ones." My husband, overhearing this answer, quips, "Do you really need a Ph.D. to push fruit flies around all day?" Perhaps not, I reason, but great insights often result from tedious tasks. The father of genetics, Gregor Mendel, for example, spent much time counting and sorting peas for his genetic experiments. As his hands worked, however, his mind was busy brainstorming and building hypotheses.

Sorting fruit flies ultimately helps me understand the genetic causes of birth defects like Down Syndrome. I study genetic mutations that cause an imbalance of meiotic chromosome segregation. In meiosis, the chromosome content is halved during formation of sperm and eggs. Through understanding these mechanisms in fruit flies, I hope to gain insights into how they work in humans.

I don't sort flies every day. Some days, I might study DNA, and others I might separate proteins in a gel. Often, I squash the testes of male flies and stain the chromosomes with fluorescent dye so I can collect

images of the meiotic cells with a microscope. The time I do spend sorting flies, however, allows me to analyze current experiments and to design newer ones. This time is also good for discussing science or arguing about the latest political crisis in Washington with a nearby fly sorter.

My interactions with colleagues have certainly dispelled the stereotype of researchers who spend lonely days collecting data. But most of all, I love to work at the lab bench doing experiments. I spent most of the time at my first lab job looking at labeled cells through a fluorescent microscope. I can recall staring into the darkness of the microscope at the glowing cells, thinking that it looked like outer space. Twelve years later, when I look through the microscope to begin analysis of my next experiment, I still see outer space. ■

Jacque Lopez is a post-doctoral fellow at the Whitehead Institute for Biomedical Research in Cambridge, MA, and

hopes someday to run her own lab. When she's not squashing bugs, she enjoys cooking, skiing, and camping with her family.



## Psychiatry

by Michele Baker, M.D.

**P**sychoiatrists must be inquisitive, sympathetic, and patient. They must be able to conceptualize a wide range of human emotion, experience, and behavior in terms of a classification system as complicated as Russian grammar. They must be detectives, able to research lab tests and studies in order to develop the most accurate diagnoses. They must memorize the names of more medications than are prescribed in any other field of medicine—and understand how they work.

For me, psychiatry is a lot like academic research. I'm presented with an array of material—the patients' words, dreams, expressions, body language—and I have to make some sense of it all. But in psychiatry, the texts are the lives of my patients, and I am invited to bear witness to their most

# of Medicine

vulnerable selves, to share their most unspeakable secrets. If there is a trusting alliance between patient and therapist, a psychiatrist can become as intimate with the human soul as a neurosurgeon is with the deep white matter of the brain.

Gaining someone's trust takes work. Once you have it, the results can be electrifying, and emotionally exhausting. Patients very often leave their marks on me. The depressed have left me feeling sad, hopeless, and nihilistic. Manic patients have boosted my adrenalin sky-high. And drug addicts have led me to share their own inability to handle frustration.

Although it can be draining, I must always bring myself into each session, every evaluation: of all the diagnostic tools I have, none is more useful than my own experiences, personality, and imagination. I can measure thyroid levels or order a CT scan, but psychiatric evaluation depends on calculations that are more complex and intuitive than any diagnostic test. I am trying to understand how other minds work, and that involves every part of who I am.

If you thrill at moments of personal connection, if you're flexible and curious and open to all human experience, then you might just love psychiatry. ■

A graduate of Yale University School of Medicine, **Michele Baker** is in her second year of the Harvard-Longwood Psychiatry Residency Training Program in Boston and has recently been

working on a children's book about her dog



## Emergency Medicine

by Ari M. Perkins, M.D.

In my last year of medical school, hoping to gain experience in procedures and to see a wide variety of patients and diseases, I enrolled in a rotation in the emergency department. I had enjoyed my previous rotations in internal medicine, surgery, pediatrics, and obstetrics, but emergency medicine was altogether different. Now, instead of caring for a single patient at a

time, I was caring for multiple patients ranging from children with colds to adults with stab wounds, which I found overwhelming and sometimes scary.

Working in an emergency department is both intense and exciting because you never know what you are going to see next. Each new patient may or may not have a serious condition, and part of the challenge is the constant shifting between moderate and high levels of care. The care you provide also depends on teamwork between physicians, nurses, and technicians—an additional challenge because each member depends on the skills and reliability of the others. The work can be stressful, but unlike in many other specialties, most emergency doctors work set schedules—you know when you're coming in and you know when you're leaving. Days off are really days off, not "on call." This usually allows for ample time to spend with friends or just relaxing.

As my rotation came to an end, I realized that what had once frightened me about emergency medicine now attracted me to the field. Emergency medicine encompasses the entire range of medical specialties—for emergencies can involve almost any system in the body. I encounter new people and new diseases every day. And that means that I'll always be challenged and never stop learning. ■

**Ari Perkins** is now completing his first year of residency in emergency medicine at the University of Maryland Medical Center in Baltimore.



## Anesthesiology

by Eugenie Heitmiller, M.D.

I love being an anesthesiologist. As medical doctors who specialize in the relief of pain and the care of patients before, during, and after surgery, anesthesiologists complete four years of medical school, a year of internship, and three years of residency in anesthesiology. If you include college, that's a total of 12 years of training after high school. The work was often very hard but also a lot of fun.

I specialize in general anesthesia for children undergoing surgery, tests, and treatments. Most days, I arrive at the hospital at 6:30 a.m. After changing into surgical scrubs, I go to meet my first patient. My patients are usually small, hungry, cranky children with very anxious parents. So part of my job involves explaining the anesthesia plan and helping to reassure the parents by answering questions about what is about to happen to their child. Since many of the kids are also nervous or uncooperative, I often give them a cherry-flavored sedative to drink. After about 10 to 15 minutes, the patients are all smiles and don't mind coming to the operating room with one of the parents.

There, I administer anesthetic either through a gas mask or an injection. After the patient is asleep, his or her safety is in my hands. During the surgery, I closely monitor the blood pressure, heart rate, breathing, and level of consciousness while maintaining an appropriate level of anesthesia. In case of any problems, I have to know all about medications that control blood pressure, heart rate, and breathing as well as anesthetic drugs.

When the patient wakes up after surgery, I take him or her to the recovery room where I continue to monitor progress and order any necessary medications. Soon, the parents arrive, happy and relieved that their child has safely gotten through the procedure.

After nearly 20 years, I still find anesthesiology exciting and challenging. I'm always learning because of the continuous development of new drugs, new types of operations, and new equipment. And, of course, with each new patient comes a new possibility for making what is for most people a difficult and frightening experience a little safer, a little easier. ■

Currently an associate professor of anesthesiology and pediatrics at the Johns Hopkins School of Medicine, **Eugenie Heitmiller** is also a mother of four who enjoys travel, tennis, and reading.



Continued on page 14

# The Lure of

*Q: How many lawyers does it take to change a light bulb?*

*A: How many can you afford?*

*Lawyer jokes pervade our culture, but that hasn't stopped the profession from attracting some of the nation's best and brightest. Here, five of them share what drew them to the law.*

## Apologies of a Lawyer

by Eugene Volokh

When I was a kid, I was marked for mathematics. I was fated to be a math whiz, then a math major, then a math grad student, then a Mathematician. An honorable, intellectual, decent profession.

Now I'm a lawyer. Where did I go wrong?

Math and science are wonderful things. I wish we had fewer lawyers and more mathematicians. And yet there are two things I found the hard sciences didn't provide, two things I really wanted in my life.

The first is a *focus on people*. We live in an amazingly complex society. It's hard to say whether the social world is more complex than the physical or biological world, but it's differently complex. And it's tied together, and sometimes ripped apart, by Law.

Criminal law, constitutional law, property law, employment law—all these are attempts to answer the question, "How does one fairly, efficiently, and successfully run society?" This, it seems to me, is at least as fascinating a question as "What is the universe made of?" or "How does one write a computer program that understands human language?" It's a question very much worth thinking about.

The second is a *public life*. I wanted to be a player; I wanted to be the sort of person who writes op-ed pieces, who argues the big constitutional law cases, who pushes society—ever so slightly—in one or another direction. There are people like that in law; some are judges, some lawyers, some

academics. Professor Catherine MacKinnon, who single-handedly invented sexual harassment law. Alan Dershowitz, about whom you've doubtless heard. Thurgood Marshall and Ruth Bader Ginsburg, who, even before they became Supreme Court Justices, had an enormous impact on the nation's life.

I don't for a moment suggest that law is a worthier way to spend one's life than any other. Perhaps it's less worthy. Maybe it's better to leave one's mark on society by helping develop cheap fusion or discovering a new drug. But if one feels the pull of one's nature, sometimes one can't, and shouldn't, resist.

Some people who feel this pull become politicians, either elected or appointed, but that wasn't for me: too much people management, not academic enough. What I decided on—being a law professor—is much more up my alley, a happy medium between theory and practice. Others might become public interest lawyers, or trial lawyers, or corporate dealmakers. Even those who don't care about leaving their mark on society can still enjoy making headlines and multimillion-dollar commercial transactions.

If you've harbored similar traitorous thoughts—if you've lusted in your heart after my much-despised profession—maybe you should consider stepping out of the closet. Law school is neither as hard nor as nasty as people say it is. Legal thinking, and sometimes even legal practice, can be extremely stimulating intellectually. And some of us just have it in our blood, whether we want it or not. ■

Eugene Volokh teaches free speech law, copyright law, and the law of firearms regulation at UCLA Law School. Before going into teaching, he clerked for Supreme Court

justice Sandra Day O'Connor. To learn more about his interests, from the serious ("Cyberspace Law for Non-lawyers") to the humorous ("Eschew, Evade, and/or Eradicate Legalese"), see [www.law.ucla.edu/faculty/volokh](http://www.law.ucla.edu/faculty/volokh)



## Intellectual Property Law

by Beth Winston

"You're gonna need a good lawyer" is a phrase most people hope never to hear. But to an inventor, it can be a sign of success, a signal that his or her brainchild is finally valuable enough to be protected by law. When that time comes, an inventor needs a lawyer who can arrange such legal protection: a patent attorney.

I first appreciated the need for lawyers who understand engineering while working as a software engineer. Engineers and lawyers both rely upon specialized, technical vocabularies, and many engineers and lawyers have difficulty discussing their work in non-technical terms. However, a lawyer can help a scientist protect an intellectual product only if the two can communicate clearly. Engineers thus need lawyers who can speak their language to represent their interests in legal procedures like patent applications and contract negotiations.

I majored in math in college, but my brief stint as a software engineer showed me that, while I enjoyed working with engineers, solving problems, and being surrounded by a constant flow of new ideas, I craved more varied interactions with people. I realized that being a patent lawyer would allow me to use my knowledge of engineering and to work closely with a broad range of people.

Law may seem far removed from engineering and math, yet the disciplines actually require many of the same qualities: logic, hard work, intense work for short spurts of time, a good memory, and an enjoyment of problem solving. The intellectual discipline I developed studying math and computer science helped me in law school.

As a patent lawyer specializing in computers, I work with many different people and am surrounded by fascinating new technologies. The problems I face are no longer software bugs, but rather the challenges of translating engineering accomplishments into legalese. I really enjoy this



# The Law

intersection of law and technology and feel that it's a career that uses and challenges all of my abilities. ■

A graduate of Thomas Jefferson High School for Science & Technology and MIT, **Elizabeth Madden**

**Winston** attended law school at the University of Virginia. In her spare time she enjoys swing dancing

with her husband, a patent lawyer to be and fellow MIT graduate.



## Criminal Law

by Catherine Brockenborough

**D**o you believe in the rights that our country's Constitution assures every citizen? Do you feel passionately protective toward the underdog? Have people mentioned that you'd make a great lawyer because you debate and argue so often? If you answered yes to these questions, a career as a public defender may be for you.

The role of the criminal defense attorney is to ensure that the government—the State—does not abuse its power and authority. We provide the checks and balances in the criminal justice system. We make sure that the State does its job properly, without trampling on the rights of its citizens. Public defenders are criminal defense attorneys who represent clients who cannot afford to hire an attorney—the vast majority of people who come through the criminal justice system.

For nearly three years, I've worked in the Office of the Metropolitan Public Defender in Nashville, Tennessee. My first year there, I represented adults charged with misdemeanor offenses. Most of my clients could not make bond, so I spent a great deal of time at the jail. Since June 1997, I have been in the Juvenile Division. My clients are now children under the age of 18 who have been charged with breaking the law.

Many people ask me, "How can you do that job? How can you represent *those*

people?" My answer has become, "How can I not?" Often, I am the first person who has ever stood up for my clients—children and adults alike. What does it say about our society that the first time a person may experience being worthy of someone's advocacy is when he or she is facing criminal charges?

Despite the frustrations of this work, I love my job and I can think of nothing I'd rather do in the legal arena. Whatever you choose to do with your life, make sure it's something that excites you and helps you get out of bed in the morning. Have a passion for your work. Bring your best to what you do and let your work bring out the best you have to offer. ■

After studying history at Yale University, **Catherine Brockenborough** completed a J.D. at Columbia University. You may ask her questions about the law or her job by contacting her at

CatherineBrockenborough@jns.nashville.org



## Public Interest Law

by Dawn Goldsmith

**H**istory classes in college first sparked my interest in law. Learning about landmark cases that helped advance the cause of civil liberties showed me the power of the law to effect social change. During law school, I tried out several kinds of law until at last, while working at the Department of Justice, I found what I was looking for: the sense of using the law to help improve our society. After law school, I applied to several government agencies and was hired by the Food and Drug Administration (FDA).

The subjects of FDA cases vary widely. Most of the time, the FDA is the plaintiff, suing drug and food purveyors to enforce government regulations. I've argued cases concerning decomposed shrimp, expired pharmaceuticals, and medical devices lacking FDA approval. In other cases, the FDA is the defendant. I'm now working on a defensive case that concerns the drug approval and initial marketing process.

When companies apply for FDA approval of a new drug, their data typically come from studies done on adults. Very little data exist on whether most drugs are safe and effective for children. Congress recently amended the FDA's statute to encourage pediatric studies of drugs; however, some drug companies are unhappy with the way the FDA has implemented that amendment and have sued the agency. As this case suggests, the FDA's defensive cases can involve important policy issues and have wide-ranging implications.

A scientific background isn't necessary to work as an FDA lawyer; I had none and have gotten a real education on the job. Many of my colleagues, however, came to the FDA specifically to combine their legal training with interests in public health, chemistry, medicine, or biotechnology.

In my job, I am constantly facing new issues of criminal, constitutional, and administrative law. I work with people who like what they do and who think our work is important. I find tremendous satisfaction in the responsibility I am given, the variety of issues I face, and the feeling that I am helping to ensure the safety of the nation's food, drugs, and medical devices. I feel fortunate to have found a place at the FDA. ■

**Dawn Goldsmith** earned a B.A. in Russian studies from Brown University and a J.D. from Stanford Law School. She enjoys running and scuba diving.



## Appellate Law

by Keith Evans-Orville

**I**'ve always been interested in the "public sphere" social sciences—history, political science, economics—and briefly considered becoming a political scientist. In college, though, I began to suspect that law would be a better career for me. Unlike some fields, law's "cutting edge" is not in academia, but in the real world, advanced by lawyers and judges and real cases. I realized that I wanted the opportunity to act, to do more than study and analyze what was happening.

*Continued on next page*

Law offers the opportunity to work on issues that are, quite literally, matters of life and death. Not every case will have such stakes, but each offers the possibility of making a genuine difference for someone else. It is this direct contact with real individuals that drew me to, and keeps me in, the law.

I've chosen to specialize in appellate litigation because it is in the courts of appeals that the law is shaped. There, the practice of law is more deliberative, and the judges have the time to address novel issues more thoughtfully. Recently, for example, my colleagues and I were able to persuade an appellate court of the merits of an unusual contract theory, thereby allowing a Hollywood director's heirs to proceed with their case against the studio for money owed from his Oscar-winning efforts. In another case, we were able to persuade an appellate panel of the possible merits of our death-row client's claims of constitutional error in his sentencing. In each case, the trial court, with more pressure and less time, had dismissed the claims out of hand. Coming in at the appellate stage, I had more time to select and craft the best arguments and to reflect on the best way to proceed.

The practice of law is not, however, without its significant downside. Aspiring lawyers are warned about the long hours and endemic stress, but it is another matter entirely to live these stresses and to see their effects on one's self and one's family. No profession should be chosen lightly, but law even less so than most. If you are considering a career in law, honestly evaluate yourself, your goals, your strengths, and your weaknesses. Talk to practicing lawyers. Think carefully about who you would want to represent and what kind of practice you might want to shape. Having a clear idea of your goals is the best way to find the satisfaction you seek. ■

A graduate of Yale and UC-Berkeley's School of Law, Keith Evans-Orville is an associate at a San Francisco law firm. When not at work, he can be found escaping to the scenic hills of the Bay Area with his wife, Kirsten, and his Labrador, Tucker.



## What is a Clerkship?

by Beth Winston

*Most of our authors clerked for a year or two after law school. Here's a look at this special time in a lawyer's career.*

**L**aw clerks are recent graduates of law school who aid judges in researching questions of law. For a young lawyer, it's a unique opportunity to observe and be part of the judicial side of the legal process. Clerks get to know their judges well and get to see up close how a judge weighs issues and what kinds of arguments are effective. The understanding you gain of the judicial process cannot be taught in any class.

A clerkship is a rare time when you have the opportunity to practice pure law; you take no sides. Every brief and argument is evaluated fairly on its merits; you bring no client bias to the case. You learn not to be scared of the courtroom or of a judge. You gain a deeper understanding of the judicial process, and you come to appreciate that judges are human too. My experiences as a clerk were the best part of my legal education, and I recommend the experience to anyone who has the opportunity. ■

## Cardiothoracic Surgery

by Octavio E. Pajaro, M.D., Ph.D.

**I** grew up playing in hospital corridors as I waited for my father, a general surgery resident in a community hospital, to finish work. When my father developed a surgical practice in a mostly black and Hispanic community, our friends included the people he treated. He would fix their gallbladders, they would fix our car. In time, I came to understand why my father loved helping others.

In medical school, I became fascinated by cardiac physiology. On one hand, the heart is a mechanical system, begging to be explained by mathematics and physics. On the other, it's a biological system, full of mysteries concealed in the realm of molecular and cellular biology. Cardiac surgery was irresistible to me because it allowed me to link scientific understanding with caring and technical skill.

On my first day of training, I admitted Mr. C, an affectionate 55-year-old gentleman who had received a heart transplant several years earlier. His body was rejecting the foreign heart, and he needed special medication to stop the rejection. Soon after I administered it, Mr. C became extremely short of breath. With the right treatment, Mr. C pulled through that night but had many miserable days ahead. I stayed late every night that month to give him his anti-rejection medicine at 9:00 p.m. We spoke often, and he disclosed his great wish to live long enough to one day have a grandchild.

Five years later, I was called into the emergency room to see a patient who had cut his hand. There was Mr. C sitting with a bandage around his left hand. Before saying a word, we gave each other the warmest, tightest hug. He had cut himself building a doll house for his granddaughter.

Now, almost nine years since I met Mr. C, I am chief fellow in cardiac surgery. I arrive at the hospital at 6:00 a.m. By 7:15, I am scrubbing for my first case, going over in my head what my goal is for my first patient. I stand in one place operating for almost 12 hours a day. During surgery, concentration is so intense that the senses become more sharply tuned than ever. You can hear and follow three conversations at once. You can feel with your eyes as an assistant handles the tissues. You can speak so softly that not even the nurse standing next to you knows that you're having a conversation with the surgeon across the table.

I have experienced the exhilaration of correcting the wrongs wrought by nature and the environment as well as the lows of failure due to medicine's limits. The driving lesson to me has been the paramount importance of compassion and humanity—right alongside professional competence. ■

Octavio Pajaro is currently preparing to join the staff at the Mayo Clinic, Jacksonville, FL, where he will be surgical director of the heart and lung transplant program and start a transplant biology research lab. When he's not working, he enjoys spending time with his family and teaching his children music, sports, and chess.



# Taking the Lead with Future Business Leaders of America

by Jason Sickel

*FBLA, a professional organization that prepares student leaders for careers in business, offers educational materials and incentives, seminars, skills training, and scholarships. FBLA is also a service organization that has been one of the most successful fund raisers for the March of Dimes. On the local level, FBLA members conduct outreach to schools, community, and charitable organizations. Members enhance their professional skills by managing media relations and fund-raising drives and by forming partnerships with businesses.*

I could barely contain my excitement as I sat in my chair at the National Leadership Conference in Orlando, Florida. My heart was pounding wildly and I thought they were never going to get to the announcement I had been waiting for. At last, I was declared National Treasurer of FBLA. The smile on my face hardly expressed the happiness and gratitude I felt. I was now a national officer of a highly respected student organization—one that had come to mean more to me than I could have ever dreamed.

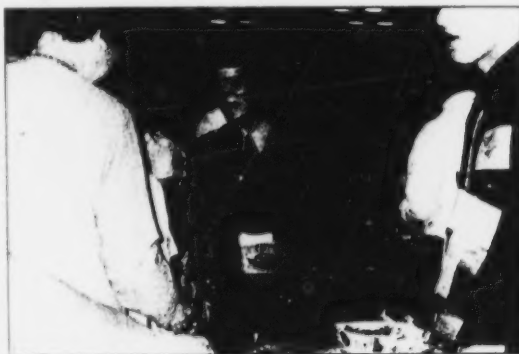
## Part of the Team

As a freshman in high school, I was eager to join a student organization. But after two weeks of school, I still hadn't chosen one. Then, while walking down the hall one day, I noticed a large sign with "FBLA" printed on it in big, bold letters. I knew little about Future Business Leaders of America, but the sign intrigued me and I attended the first meeting.

I very quickly learned what FBLA does and how it operates. We planned community outreach projects like business awareness expos, where we introduced the public to the services and employment opportunities offered by various local businesses. We toured businesses to learn more about the duties and challenges of various occupations. We participated in service projects like providing holiday fruit baskets to the residents of a local nursing

home, and worked to increase community support for FBLA.

I discovered that FBLA depends on the input and initiative of even its newest members. As a member of the community awareness committee, I developed ideas for attracting publicity and met influential community leaders with whom I discussed FBLA's mission to offer teens real-life application of business and communication skills. For the first time in my life, my shy and hesitant voice was actually being heard!



Jason campaigning at the 1998 National Leadership Conference in Orlando

That spring, I attended the Kansas State FBLA conference, which inspired me to become even more involved. In fact, conferences are my favorite aspect of FBLA. Held at the state, regional, and national levels, they offer members from different chapters the chance to meet each other and to develop business skills in a fun, supportive environment. The annual National Leadership Conference features a four-day training program where members develop skills in entrepreneurship, communication, and leadership. Conferences also include over 30 competitive events that test members' business knowledge, technological literacy, and communication skills.

## A Quest for Leadership

In my junior year, I decided to run for National Treasurer. Through projects and

conferences, I had become deeply committed to FBLA and wanted to take on the challenge of national leadership.

Campaigning for office was the hardest thing I've ever done. I began by developing a platform that focused on improved communication, increased membership, and greater interaction between FBLA and businesses. Then my campaign manager and I spent months getting this message out to the vast network of friends that I had made at conferences—an undertaking that immeasurably enhanced my organizational skills.

I completed the election process at the National Leadership Conference. I had to take a test, participate in an interview with the national board and officers, and give a campaign speech to an audience of 5,000 members. In addition, I caucused with members from every state in the nation, answering a battery of questions that challenged my intellect and my endurance. Although exhausting, it was one of the most thrilling experiences of my life.

When I joined FBLA, I was timid, disorganized, and inflexible. But signing my name on that membership list led me to make friends all over the country and achieve a level of leadership that I never imagined. My involvement with FBLA has shown me that if you believe in what you're doing and are willing to learn from others, you are bound to take the lead and inspire those around you. "I

A senior at St. Marys High School in St. Marys, KS, Jason Sickel is the 1998-99 National Treasurer of Future Business Leaders of America. When he's not busy with FBLA, he also enjoys musical performance, forensics, and reading to first graders at the local elementary school.



For more information contact  
FBLA, 912 Association Drive, Reston, VA 20191  
(703) 860-3334 [www.fbla-pbl.org](http://www.fbla-pbl.org)

**W**HEN did you last set out on a great adventure? Outdoor education programs provide supervised experiences that allow you to challenge and develop almost every aspect of who you are. A brief, intensive course can turn you into a skilled kayaker, sailor, backpacker, or snow-shoe artist. It may also leave you more resourceful, flexible, and joyful—someone who can appreciate outdoor hygiene, guzzle iodine-tinged river-water, and enjoy a long day on a crowded rowboat.

Outdoor courses can seem loosely structured, even unpredictable. Outward Bound trips, for example, unfold as they go, with activities such as solos, rock-climbing, and ropes courses barely mentioned in the course catalogue. Joan Welsh, President of Hurricane Island Outward Bound School in Maine, explains that OB courses always encompass an orientation, skill development, intensive practice, a mini-adventure, a solo, and a final phase, in which students take responsibility for their journey's successful completion.

Outward Bound is ultimately an interpersonal experience. Morning briefings and evening debriefings unify each course. Yet, as the following article shows, an OB trip can also be a startling, enriching adventure for the individual. After reading about this writer's New England hike, you may decide that you, too, are ready to go outward bound.

# HAPPY

## Transforming Body, Mind, and

by Lesley Mackay

Photo by Thomas Daniel



Students backpack through dense forest in western Maryland. Outward Bound students learn and practice "Leave No Trace" techniques to minimize impact on the wilderness.

### Day One: Team Exercise

Our new group of 12 stands hand-in-hand in a scruffy patch of the New Hampshire woods. We have accepted our first challenge: to get the awkward chain of us over a taut rope no one is tall enough to jump. It's our first opportunity to practice the great precept of Outward Bound—teamwork. Supported by the hands of two teammates, I push off from Brian, who, kneeling, makes his thigh into a platform for my boot. I clear and land cleanly. Only Brian touches the rope as we try to help him over from the other side.

We drop hands, and, at our instructors' suggestion, break out running. I pick up speed and push to the front of the pack. The front of the pack! I run and run along wooded pathways, then thoughtlessly leap a yellow rope hanging between two trees. My heel catches on the rope, and I crash in an instant into the dirt. I bounce right back up, as if nothing in my life had ever hurt me.

### Day Two: Skill Building

Our first wake-up together, we slide sleepy and dirty out of our tents and quickly get to work. One group breaks down camp. Another hikes to the nearest river to fill our water bottles. Louis, from Ohio, and I stick around and set up breakfast. He teaches me how to bake cornbread over a flame—between a tiny, fuel-powered stove and a bonfire of twigs on the cake-tin cover. The cornbread cooks in singed, delicious sections.

At our morning briefing, our instructors Linda and Mike run down the skills we will need to complete our course. Like navigators of old, we stare at the pen-and-ink shadings of maps, trying to visualize the topographies they represent. We learn that with a map and a compass, we can deduce our current location, set out for our next destination, and check ourselves as we go. Tentatively, we make some plans.



# TRAILS:

## Spirit with Outward Bound

### Day Four: Beyond Treeline

"Let's go," Mike calls, interrupting the best nap of my life. For 20 minutes, I've dozed on a large rock in a frothy, chanting river. I get up, jump to the river's edge, and look for my backpack. It holds everything Outward Bound told me to bring: lots of nylon and thermal wear, extra shoes, toiletries, and eating implements, as well as community goods I picked up at base camp—large bags of granola, oranges, and gorp, and a spade for repairing pathways. Spotting its familiar lumps, I grab the 50-pound pack and push it up a tree. I flip around, thrust in my arms, and cinch cinches until it sticks like a shell to my back.

The group goes up and up. This is the hardest physical work I've ever done. About 3:00 p.m., the sky darkens a little, and we stop at an alpine garden, a miniaturist plateau among the rough peaks. We walk lightly on the garden's pebbled ground jeweled with lichen, cranberries, and white flowers. We take each other's pictures teetering on the land's edge, a drop and a trail of green mountains in the background. We stare at the proud rocks and the krummholz—small, wind-blown trees, dead-branched, like broomstick bonsais.

### Day Five: The 24-Hour Solo

Today we each begin a 24-hour period alone, a trademark of the Outward Bound experience. In the morning, many of us look daunted. Hasn't our hike been challenging enough without a bout of seclusion? We get up, breakfast (we may fast for the rest of the

day), make small talk, shuffle the musty insides of our packs. Then, one by one, we let ourselves be guided and dropped off—alone, yet within yelling distance of another group member. My solo spot is on one side of a creek bounded by two boulders, one golden, one black, poised gravely in the water.

Linda ties a bandana to a branch hanging over my patch of the creek and quickly takes off. I make two trips with my stuff up the spongy, pine-needled bank of the creek and into the woods, looking for a flat place where I can unfold my sleeping bag and set up my tarp among the trees. Both times, a toad hops from a hole in the base of a tree



*The mountains of western Maine offer plenty of challenges and breathtaking views.*

kind of special moment, a "peak experience," I slide down to the creek. I strip off most of my clothes, wade into the cresting water, and crouch on my heels. Surveying the quiet woods, I will my aches and pains to fall into the water, my fear of failing as a backpacker to vanish into the air. I breathe deeply, trying to take in the peace all around me. The sun comes out from behind a cloud. Just a little. I start to cry.

### Final Challenge: The High Ropes Course

From 40 feet up, the world looks different. When we arrive at the high ropes course on this, our second-to-last day, I am surprised, even shocked. I had thought we were on the downhill stretch. Now, I'm not sure if I will don a hard hat and pull myself spinning up a rope ladder to the beginning of an obstacle course high up in the trees. Or edge sideways on the arches of my feet along a metal cord with only a lax rope at mid-height for guidance. Or jump from a platform into the air to fall backward, hoping that the rope I'm wearing will guide me to the flat-planed tree trunk far below.

I decide that I am too afraid to leap from that platform. But I do push past my fear of heights to complete the first half of the

Photo by Brian Peterson



*Journaling is an important part of the Outward Bound experience and a great way to grab a quiet moment.*

to stare at me, and a red squirrel runs amok on his branch, chattering a loud warning.

Once settled, I write in my journal for hours. At mid-afternoon, craving some

ropes course. Up in the trees, I feel strangely at one with my teammates calling to me from the ground—especially Jenna. She and I wear the ends of a single rope, its mid-section anchored and guided somewhere in the branches above me. Jenna slackens and tightens the rope through a lightweight metal clip in her hands. If I fall, the clip will lock, suspending me in mid-air.

I don't fall. And in retrospect, I wish I'd jumped out into the blank white sky over and beyond that austere, lonely treetop.

Set your sights high, they teach you at Outward Bound. Did I do that? The final evening of our hike, at an informal ceremony, our group sits in a log cabin back at base camp. We shift our aching bodies from side to side and praise each other's strengths. Toward the end, I get a tiny pin. "For courage," somebody says. ■

*Lesley Mackay completed Outward Bound's 8-day hike in Maine and New Hampshire in summer 1998.*

Photo by Matt Ensle



A student collects water for cooking. "Leave No Trace" camping techniques require campsites to be a minimum of 200 feet from trails and water sources.

### An Outdoor Education

Outward Bound courses feature backpacking, canoeing, kayaking, sailing, snow sports, rock climbing, biking, ropes courses, community service, and more. The international program includes special courses for teenagers. Offerings reflect the topographies of the organization's diverse headquarters.

All of the experiences described in this article took place at the Hurricane Island Outward Bound School. To order a free catalog from HIOBS, call (800) 341-1744. To learn more about all Outward Bound programs, call (888) 88-BOUND or see [www.outwardbound.org](http://www.outwardbound.org)

Investigate, too, the National Outdoor Leadership School at (307) 332-6973 or [www.nols.edu](http://www.nols.edu) and the Huibert Voyageurs Youth Wilderness trips at (802) 333-3405 or [www.alohafoundation.org](http://www.alohafoundation.org)

## More Voices From Outward Bound

### Standing Room Only: 22 Days on a Sailboat

by Stacy Stiehl

Last August, I participated in an Outward Bound 22-day sailing trip off the coast of Maine. Our group of 14 sailed from island to island, sleeping mostly in the 32' boat, except for the four days and three nights of our solo, which we each spent alone on Hurricane Island.

Learning to sail was the hardest thing I've done. We got up each day at 5:30 for a swim in the ocean. We didn't sleep until about 11 at night, and even then, we had to wake ourselves up to help keep watch. Our instructors kept us on a point system—we got 1000 points per day and gave up 100 each time we asked them a question. The idea was for us to rely on ourselves and on each other.

When we started, only one member of our group knew how to sail. But we all learned everything we needed to know. Our last week out, we sailed without help from our instructors. When I got back, I borrowed a friend's sailboat and took it out on my own. I still feel like a much more confident person as a result of the trip. And I'm still in touch with my group members. I think everyone should do Outward Bound. ■

*Stacy Stiehl, 15, is a sophomore at Madison High School in New Jersey.*

### Building Boats, Building Communities

by Jarrod Gholston

Philadelphia high school students must satisfy a rigorous community service requirement. And so, last May I found myself working as an apprentice at a local boat-maker in collaboration with Outward Bound. With three other students, I made a simple canoe.

Then I participated in an Outward Bound seven-day sail. But we couldn't sail because there was no wind. For seven days straight, we rowed. In the evenings, when a breeze would pick up, we would fall into a heap on the floor of the boat.

I loved the intellectual challenge of navigating—keeping an eye on the buoys in the water, keeping track of depth, steering by compass. And I also loved the technicalities of the rope-work in sailing. By the third or fourth day, I had it down.

Just as beautiful to me is the challenge of building a boat with your hands. This summer I'll be aiding a master boat builder and teaching children the art of canoe-building, a community service I never could have performed without Outward Bound. ■

*Jarrod Gholston, 17, is junior class president at Overbrook High School in Philadelphia.*

Photo by Thomas Daniel



By the end of course, students have learned to chart a course, navigate, set the sails, and go. The final expedition is completely student-run.

# THE 1999 INTEL SCIENCE TALENT SEARCH

*On March 8, 1999, 14-year-old Natalia Toro, of Boulder, Colorado, became the youngest person ever to win the Science Talent Search (STS), the nation's most prestigious precollege science competition, now in its fifty-eighth year.*

It had the ingredients of a science fiction thriller: a massive particle detector buried half a mile underground and subatomic particles changing identities. "When I first heard about it, it seemed so strange—as if dogs could turn into cats," Natalia recalls about the announcement by an international team of physicists that certain fundamental particles could oscillate, or change, into one another.

The particles in question were neutrinos, the least understood members of the subatomic family. These elusive entities rarely interact with other matter, making them very difficult to detect. Like several other subatomic particles, neutrinos began their scientific career as fudge factors invoked to make the math come out right; their existence was posited to make a radioactive decay equation comply with the law of conservation of energy. Neutrinos come in three "flavors," named for the other subatomic particles they associate with. A landmark experiment in 1968 recorded the first trace of neutrinos produced by nuclear fusion in the sun. The only problem was that it detected many fewer neutrinos than were predicted on theoretical grounds. Since then, physicists have puzzled over the solar neutrino shortage. The June 1998 announcement offered a solution: evidence that neutrinos could oscillate between flavors, one of which escapes undetected.

Natalia was at the Physics Olympiad training camp when she heard the news. At 13, she had been chosen as an alternate to the team that would represent the United States at the International Physics Olympiad that summer. A few weeks later, when she arrived at MIT to begin an internship at the prestigious Research Science Institute (RSI), she was thrilled when her mentor suggested that she work on neutrino oscillation theory.

Thrilled—and well-prepared. Natalia had studied calculus when she was 11 and then completed a college-level course in quantum mechanics. She was ready for the rigors of deriving mathematical equations for neutrino oscillations, then comparing her results with experimental data.

"At first, neutrino oscillation theory seemed bizarre, but after I worked with the equations for a while, I had a conceptual breakthrough. Instead of seeing the phenomenon as three kinds of neutrinos that could change into one another, I suddenly saw it as one kind of particle with three different states. If you think of the oscillations as transformations of a single particle, it makes much more sense. It was really beautiful to see how everything fell into place. That's what I love about physics—the ability it gives us to describe nature mathematically, to formalize what we see, and to answer fundamental questions about the universe."

And Natalia's work does help address a fundamental question about the universe: where's the mass? Astrophysical calculations

predict that the universe contains about ten times more mass than has thus far been detected. The missing mass has been dubbed "dark matter." "Our new estimates of the mass of neutrinos in the universe doubles the known mass of the universe," Natalia explains. "Now 20% of the theoretical mass is accounted for—which still leaves a lot of dark matter to be found." Perhaps hers will be one of the well-prepared minds that makes that discovery, too. ■

## *This Year's Top Honorees*

In addition to public recognition, STS finalists win scholarships. First-, second-, and third-place winners received \$50,000, \$40,000, and \$30,000, respectively. Fourth- through sixth-place winners received \$20,000. Seventh- through tenth-place winners received \$15,000. The remaining 30 finalists each received \$3,000 scholarships.

*This year's top winners and their projects were:*

1. **Natalia Toro**, 14, of Boulder, CO. *Independent Analysis of Evidence for  $\nu_\mu \leftrightarrow \nu_\tau$  Oscillations in the Super Kamiokande Atmospheric Neutrino Data.*
2. **David Moore**, 18, of Potomac, MD. *Quantum Calculations to Determine Electrical Properties for Molecular Electronic Rectifying Diodes.*
3. **Keith Winstein**, 17, of Oak Park, IL. *Lexical Steganography through Adaptive Modulation of the Word Choice Hash.*
4. **Carol Anne Fassbinder**, 18, of Elgin, IA. *Analysis of Monoterpenoids for Control of the Varroa jacobsoni.*
5. **Rio Gabriel Bennin**, 17, of Berkeley, CA. *N-Dimensional Equalizers and Pythagorean Quadrilaterals.*
6. **Lisa Beth Schwartz**, 17, of Roslyn, NY. *Positive Integer Sequences Satisfying a Determinant Condition.*
7. **Scott Fruhan**, 17, of West Newton, MA. *Differentiated T Cells Expressing Intracellular IL-4 in vivo Decreased in Patients with Multiple Sclerosis.*
8. **Kurt Mitman**, 16, of McLean, VA. *Short Time-Scale Variability in External Shock Model of Gamma Ray Bursts.*
9. **Diana Townsend-Butterworth**, 17, of New York, NY. *Human Neuronal Cell Model for Neurodegeneration: Cellular Stress on the Ubiquitin-Proteasome Pathway and Potential Ubiquitin Mutations.*
10. **Alexander Wissner-Gross**, 17, of Hyde Park, NY. *Rapid Granular Fabrication of Nanocircuitry: Modeling a Novel Process for the Macroscopic Control of Extended Nanoscopic Fullerene Structures.*

For more about the STS see [www.sosrs.org/sts/](http://www.sosrs.org/sts/)

For more about RSI see [rsi.org](http://rsi.org)



# ORGANIZATIONS TO CONTACT

## ACTING

Screen Actors Guild  
5757 Wilshire Boulevard  
Los Angeles, CA 90036  
213-954-1600  
[www.sag.com/wannabe.html](http://www.sag.com/wannabe.html)

## ADVERTISING

American Advertising Federation  
1101 Vermont Ave NW, Suite 500  
Washington, DC 20005-6306  
202-898-0089  
[www.aaf.org/](http://www.aaf.org/)

## ANIMATION

International Animated Film Society  
25 South Victory Boulevard  
Burbank, CA 91502  
818-842-8330  
[www.yrd.com/ASIFA/](http://www.yrd.com/ASIFA/)

## ANTHROPOLOGY

American Anthropology Assn.  
4350 N Fairfax Drive, Suite 640  
Arlington, VA 22203-1620  
703-528-1902  
[www.ameranthassn.org/](http://www.ameranthassn.org/)

## ARCHAEOLOGY

Archaeological Institute of America  
656 Beacon Street  
Boston, MA 02215-2010  
617-353-9361  
[www.archaeological.org/](http://www.archaeological.org/)

## ARCHITECTURE

American Institute of Architects  
1735 New York Avenue NW  
Washington, DC 20006  
202-626-7345  
[www.aia.org/](http://www.aia.org/)

## ARTIFICIAL INTELLIGENCE

American Assn. for  
Artificial Intelligence  
445 Burgess Drive  
Menlo Park, CA 94025-3442  
650-328-3123  
[www.aaii.org](http://www.aaii.org)

## ARTS

National Endowment for the Arts  
1100 Pennsylvania Avenue NW  
Washington, DC 20506  
202-682-5400  
[arts.endow.gov/](http://arts.endow.gov/)

## ASTRONOMY

American Astronomical Society  
2000 Florida Ave NW, Suite 400  
Washington, DC 20009  
202-328-2010  
[supernova.aas.org](http://supernova.aas.org)

## BIOLOGY

American Inst. of Biological Sciences  
1444 I Street NW, Suite 200  
Washington, DC 20005  
202-628-1500  
[www.aibs.org/careers/index.html](http://www.aibs.org/careers/index.html)

Fed. of Am. Societies for  
Experimental Biology  
9650 Rockville Pike  
Bethesda, MD 20814-3998  
800-433-2732  
[www.faseb.org/societies.html](http://www.faseb.org/societies.html)

## BIOTECHNOLOGY

Biotechnology Industry Assn.  
1625 K Street NW, Suite 1100  
Washington, DC 20006-1604  
202-857-0224  
[www.bio.org](http://www.bio.org)

## BROADCASTING

Broadcast Education Association  
1771 N Street, N.W.  
Washington, DC 20036-2891  
202-429-5354  
[www.beaweb.org/](http://www.beaweb.org/)

## CHEMISTRY

American Chemical Society  
1155 16th Street NW  
Washington, DC 20036  
202-872-8911  
[www.acs.org](http://www.acs.org)

## COMPUTER SCIENCE

IEEE Computer Science  
1730 Massachusetts Ave NW  
Washington, DC 20036-1992  
202-371-0101  
[computer.org](http://computer.org)

## DENTISTRY

American Dental Association  
211 E. Chicago Avenue  
Chicago 60611  
312-440-2500  
[www.adu.org](http://www.adu.org)

## ECONOMICS

American Economic Association  
2014 Broadway, Suite 305  
Nashville, TN 37203  
615-322-2595  
[www.vanderbilt.edu/AEA/](http://www.vanderbilt.edu/AEA/)

## EDUCATION

National Education Association  
1201 Sixteenth Street NW  
Washington, DC 20036  
202-833-4000  
[www.nea.org/](http://www.nea.org/)

## ENGINEERING

American Soc. for Engineering  
Education  
1818 N Street NW, Suite 600  
Washington, DC 20036  
202-331-3500  
[www.asee.org/precollege/](http://www.asee.org/precollege/)

## ENVIRONMENTAL SCIENCES

Ecological Society of America  
2010 Massachusetts Ave, Suite 400  
Washington, DC 20036  
202-833-8773  
[www.sdsc.edu/ESA/esa.htm](http://www.sdsc.edu/ESA/esa.htm)

## FINANCE

Financial Management Assn.  
USF College of Business Admin.  
Tampa, FL 33620-5500  
813-974-2084  
[www.fma.org/student.htm](http://www.fma.org/student.htm)

## FORENSIC SCIENCE

American Academy of Forensic Science  
Box 669  
Colorado Springs, CO 80901-0669  
719-636-1100  
[www.aafs.org/career/](http://www.aafs.org/career/)

## GENETICS

Genetics Society of America  
9650 Rockville Pike  
Bethesda, MD 20814  
[www.faseb.org/genetics/gsa/careers/bro-menu.htm](http://www.faseb.org/genetics/gsa/careers/bro-menu.htm)

## GEOGRAPHY

Assn. of American Geographers  
1710 16th Street NW  
Washington, DC 20009-3198  
202-234-1450  
[www.aag.org/](http://www.aag.org/)



# FOR MORE CAREER INFORMATION

## GEOLOGY

American Geological Institute  
4220 King Street  
Alexandria, VA 22302-1502  
703-379-2480  
[www.agiweb.org/careers.html](http://www.agiweb.org/careers.html)

## GRAPHIC ARTS

Graphic Arts Guild  
11 West 20th Street, 8th Floor  
New York, NY 10011  
212-463-7730

## HISTORY

Organization of American Historians  
112 N Bryan Street  
Bloomington, IN 47408  
812-855-7311  
[www.indiana.edu/~oahh/](http://www.indiana.edu/~oahh/)

## INFORMATION SCIENCE

American Soc. for Information Science  
8720 Georgia Avenue, Suite 501  
Silver Spring, MD 20910-3602  
301-495-0900  
[www.asis.org](http://www.asis.org)

## JOURNALISM

Society of Professional Journalists  
16 South Jackson Street  
Greencastle, IN 46135-1514  
765-653-3333  
[spj.org/](http://spj.org/)

## LAW

American Bar Association  
750 North Lake Shore Drive  
Chicago, IL 60611  
312-988-5522  
[www.abanet.org/](http://www.abanet.org/)

## LINGUISTICS

Linguistics Society of America  
1325 18th Street NW, Suite 211  
Washington, DC 20036-6501  
202-835-1717  
[lsadc.org/web/fields.html](http://lsadc.org/web/fields.html)

## LITERATURE

Modern Language Association  
10 Astor Place  
New York, NY 10003  
212-475-9500  
[www.mla.org](http://www.mla.org)

## MARKETING

American Marketing Association  
250 S Wacker Drive, Suite 200  
Chicago, IL 60606-5819  
800-262-1150  
[www.ama.org/college/](http://www.ama.org/college/)

## MATHEMATICS

Mathematical Assn. of America  
1529 18th Street NW  
Washington, DC 20036  
202-387-5200  
[www.maa.org](http://www.maa.org)

## MEDICINE

American Medical Association  
515 N State Street  
Chicago, IL 60610  
312-464-5000  
[www.ama-assn.org](http://www.ama-assn.org)

## MOLECULAR BIOLOGY

Am. Soc. for Biochem.  
& Molec. Biology  
9650 Rockville Pike  
Bethesda, MD 20814-3996  
301-530-7145  
[ns2.faseb.org/career/pubs/unlock.htm](http://ns2.faseb.org/career/pubs/unlock.htm)

## MULTIMEDIA

Academy of Motion Picture  
Arts & Sciences  
8949 Wilshire Boulevard  
Beverly Hills, CA 90211-1972  
310-247-3000  
[www.oscars.org/index.html](http://www.oscars.org/index.html)

## MUSIC

American Federation of Musicians  
1501 Broadway, Suite 600  
New York, NY 10036  
800-762-3444  
[www.afm.org/](http://www.afm.org/)

## NEUROSCIENCE

Society for Neuroscience  
11 Dupont Circle, Suite 500  
Washington, DC 20036  
202-462-6688  
[www.sfn.org](http://www.sfn.org)

## PHARMACOLOGY

Am. Assn. of Pharmacology  
9650 Rockville Pike  
Bethesda, MD 20814-3995  
301-530-7060  
[www.faseb.org/aspet/](http://www.faseb.org/aspet/)

## PHOTOGRAPHY

National Press Photographers Assn.  
3200 Croasdale Drive, Suite 306  
Durham, NC 27705  
800-289-6772  
[sunsite.unc.edu/nppa/programs.html](http://sunsite.unc.edu/nppa/programs.html)

## PHYSICS

American Institute of Physics  
One Physics Ellipse  
College Park, MD 20740-3843  
301-209-3100  
[www.aip.org](http://www.aip.org)

## POLITICAL SCIENCE

American Political Science Assn.  
1527 New Hampshire Ave NW  
Washington, DC 20036-1206  
202-483-2512  
[www.apsanet.org/](http://www.apsanet.org/)

## PSYCHOLOGY

American Psychological Assn.  
750 First Street NE  
Washington, DC 20002  
202-336-5500  
[www.apa.org](http://www.apa.org)

## PUBLISHING

Assn. of American Publishers  
71 Fifth Ave  
New York, NY  
212-255-0200  
[www.publishers.org/](http://www.publishers.org/)

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American Sociological Assn.  
1722 N Street NW  
Washington, DC 20036  
202-833-3410  
[www.asanet.org/](http://www.asanet.org/)

## TRANSLATION

American Translators Assn.  
1800 Diagonal Road, Suite 220  
Alexandria, VA 22314-2840  
703-683-6100  
[www.atanet.org/](http://www.atanet.org/)

## VETERINARY MEDICINE

American Veterinarian Medical Assn.  
1931 N Meacham Road, Suite 100  
Schaumburg, IL 60173-4360  
847-925-8070  
[www.avma.org](http://www.avma.org)

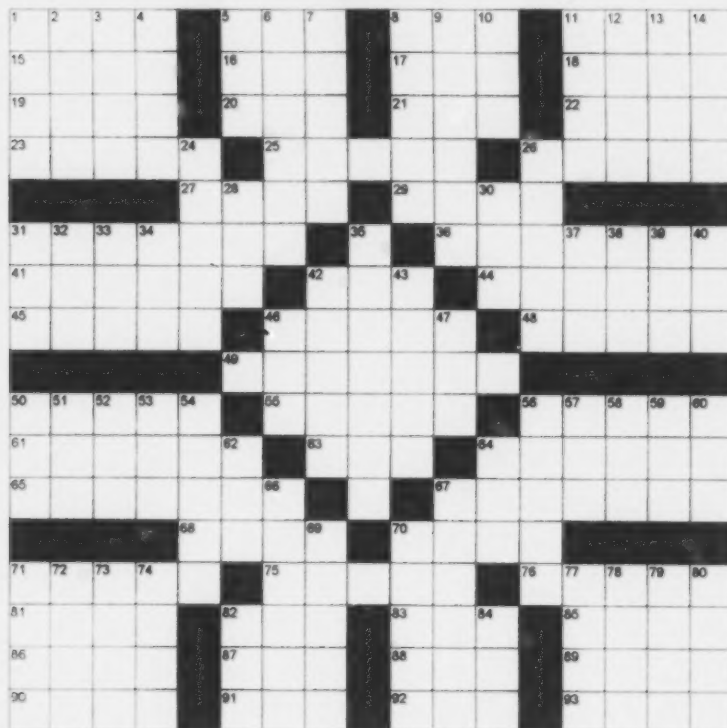
## WRITING

Poets & Writers, Inc.  
72 Spring Street  
New York, NY 10012  
212-226-3586  
[www.pw.org/](http://www.pw.org/)

# WORD WISE

by Carol Blackburn

## Career Discovery



Constructed using Crossword Weaver

### ACROSS

- 1 Public relations "doctor"
- 5 Pop
- 8 Ear (Gk.)
- 11 G-men
- 15 Dog food
- 16 Single
- 17 With 70 Down, "under penalty" (Lat.)
- 18 Concept
- 19 Breeze
- 20 Mature
- 21 \_\_\_ cuspid
- 22 Soup ingredient
- 23 Greek marketplace
- 25 Chinese-American architect

26 Wards off

27 Criticizes

29 Fairy tale opener

31 Suspects' rights ruling

36 Detective

41 After the merger

42 Accountant

44 Induce to do something illegal

45 Vulcanologist's subject

46 Italian island

48 T2

49 Optimistic, on Wall Street

50 Leaves out

55 Fold

56 :)

61 With 66 Down, "have the corpse" (Lat.)

63 Surveillance and tracking system

64 Shakespearean defense attorney

65 Bodily

67 Navy vessel

68 Love

70 Share

71 Power units

75 Textile

76 Aggressive lawyer

81 New currency

82 Mole

83 Brink

85 Woodwind

86 Up roar

87 Lymphocyte-rich fluid

88 Novel

89 Kill

90 Play a horn

91 Personals' abbr.

92 Woodsman's tool

93 Medical specialty

### DOWN

1 Story

2 Advocate

3 \_\_\_ facto

4 Our (Fr.), before a vowel

5 Dead

6 Chest pain

7 Thinks

8 Bone (Gk.)

9 Computer pioneer

10 Kimono sash

11 Dossier

12 Adam's garden

13 Legal title

14 Fifth Avenue clothier

24 Breathing disorder

26 Thighbone

28 Insert

30 Collateral usage system (abbr.)

31 Silent

32 Diminutive (suffix)

33 Oil \_\_\_

34 Cash machine

35 Java programs

37 Small Business Organization (abbr.)

38 \_\_\_ nob

39 Gold, in Guadalajara

40 Tolkien forest creature

42 Telemarketer's tools

43 Opera highlights

46 Tiger Woods' target

47 Performer (suffix)

50 Exclamations

51 Chairman

52 Big Blue

53 Assam

54 Satisfies

56 Spirits

57 Medical imaging system

58 That (possessive)

59 Perjure

60 Audiologist's concern

62 Paul McCartney, for one

64 Affirmative

66 See 61 Across

67 Kind of lens

69 "Because I \_\_\_" (2 wds.)

70 See 17 Across

71 \_\_\_ with the Night

72 Detroit specialty

73 Musical ensemble

74 Civil wrong

77 Hospital (abbr.)

78 Fit

79 Trail

80 Decoding tools

82 Service provider interface (abbr.)

84 Dolly

Solution on page 30.

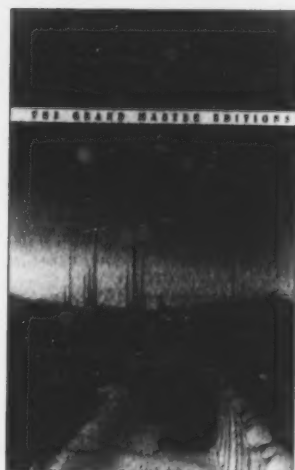
# WHAT ARE YOU READING THIS SUMMER?

## 50 REMEDIES FOR THE SUMMERTIME BLUES

Long summer afternoons are made for leaving the world behind and getting lost in a really good book. Dig in and enjoy these fiction titles chosen by students in grades 7-12.

### SCIENCE FICTION

- Brave New World*  
by Aldous Huxley
- A Canticle for Leibowitz*  
by Walter M. Miller, Jr.
- Doomsday Book*  
by Connie Willis
- Dune* by Frank Herbert
- Ender's Game*  
by Orson Scott Card
- Foundation*  
by Isaac Asimov
- The Hitchhiker's Guide to the Galaxy*  
by Douglas Adams
- A Journey to the Center of the Earth*  
by Jules Verne
- The Left Hand of Darkness*  
by Ursula K. LeGuin
- The Martian Chronicles*  
by Ray Bradbury
- A Ring of Endless Light*  
by Madeleine L'Engle



*Stranger in a Strange Land*  
by Robert Heinlein

### FANTASY



- The Colour of Magic*  
by Terry Pratchett
- The Crystal Shard (Book One: The Jewind Dale Trilogy)*  
by R.A. Salvatore
- The Eye of the World (Wheel of Time, Book 1)*  
by Robert Jordan
- The Fellowship of the Ring*  
by J.R.R. Tolkien
- The Magician's Nephew*  
by C.S. Lewis
- Pawn of Prophecy (The Belgariad, Book 1)*  
by David Eddings
- The Princess Bride*  
by William Goldman
- Redwall* by Brian Jacques
- Watership Down*  
by Richard Adams

### CLASSIC FICTION

- The Adventures of Sherlock Holmes*  
by Arthur Conan Doyle
- As I Lay Dying*  
by William Faulkner
- Beloved* by Toni Morrison
- The Chosen* by Chaim Potok
- The Count of Monte Cristo*  
by Alexandre Dumas
- Death Comes for the Archbishop*  
by Willa Cather
- Dubliners* by James Joyce
- The Good Earth*  
by Pearl S. Buck
- Go Tell it on the Mountain*  
by James Baldwin



- The Inferno* by Dante Alighieri
- Invisible Man* by Ralph Ellison
- Les Misérables* by Victor Hugo
- Oliver Twist* by Charles Dickens
- One Hundred Years of Solitude*  
by Gabriel Garcia Marquez



- The Plague*  
by Albert Camus
- The Scarlet Pimpernel*  
by Baroness Orczy
- Swann's Way* by Marcel Proust
- Their Eyes Were Watching God*  
by Zora Neale Hurston
- Wise Blood*  
by Flannery O'Connor

### FICTION FAVORITES

- Cat's Eye*  
by Margaret Atwood
- A Confederacy of Dunces*  
by John Kennedy Toole
- The Enormous Room*  
by e.e. cummings
- Ishmael* by Daniel Quinn
- The Killer Angels*  
by Michael Shaara
- The Man Who Was Thursday*  
by G.K. Chesterton
- Murder on the Orient Express*  
by Agatha Christie
- Sophie's World*  
by Jostein Gaarder
- The True Confessions of Charlotte Doyle*  
by Avi
- The Westing Game*  
by Ellen Raskin

Review by  
Diane Clavier & Trish Harris

**Diane:** Many people think of Victorian literature as stately, reserved, quaint, maybe a bit melodramatic at times. But *Wuthering Heights* is a Victorian novel that defies all of these descriptions. This dark, brooding novel never seems outdated, but expresses feelings and experiences that all readers can relate to. The subject matter and experimental storytelling techniques still feel fresh and modern.

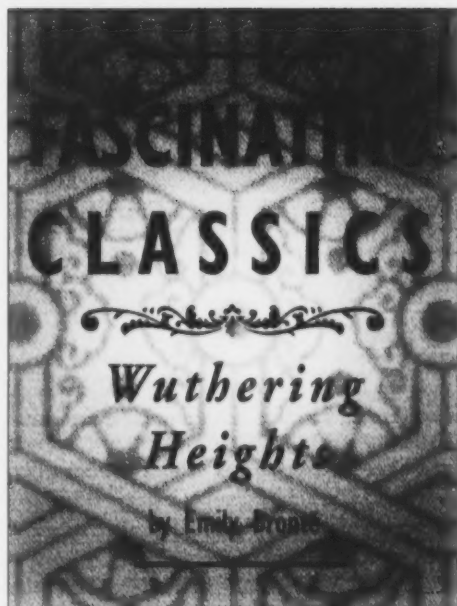
**Trish:** That's true. And unlike many Victorian writers, Emily Brontë avoids telling the reader what to think about the story or the characters. Brontë achieves a sense of ambiguity by telling the story as filtered through the minds of two very different narrators.

The story is told by the self-absorbed Lockwood, whose perception of a person's worthiness varies depending on his own desires and needs. But most of the time, he's just retelling what the busybody maid Nelly told him about her employers—and we can't take what *she* says at face value. She could not have witnessed all that she tells, and her extremely provincial perspectives often leave her at a loss to understand the people whose lives she recounts. But that doesn't stop her from filling the story with a wealth of details colored by her own biased interpretations of everyone's thoughts and behaviors.

**Diane:** So readers don't really know how much of the story to believe. This keeps the reader guessing and mulling over the book long after finishing it.

The story begins in Yorkshire in the late 1700s, at the Earnshaw estate, *Wuthering Heights*. Old Mr. Earnshaw brings home the orphan Heathcliff, whose presence immediately disrupts the household. He comes to loathe the cruel and spoiled Hindley while developing an obsessive attachment to Catherine. Catherine returns his love, but class prevents their union. When she reaches adulthood, she marries the refined Edgar Linton, young master of the nearby Thrushcross Grange.

**Trish:** She announces Edgar's proposal in what is perhaps the novel's most pivotal scene. Overhearing the announcement, Heathcliff flees



from *Wuthering Heights*—leaving before he hears Catherine's heartfelt confession of her love for him:

*I've no more business to marry Edgar Linton than I have to be in heaven; and if the wicked man in there had not brought Heathcliff so low, I shouldn't have thought of it. It would degrade me to marry Heathcliff now; so he shall never know how I love him ... he's more myself than I am. Whatever our souls are made of, his and mine are the same.*

This passage goes to the heart of what's appealing about the romance between Heathcliff and Catherine. What Heathcliff and Catherine share is raw energy, untempered will. Thus, their attachment goes beyond mutual attraction or self-interest; it even goes beyond reason. Wild and all-consuming, it dominates the rest of their lives.

**Diane:** And the constricted, provincial society in which they live has no place for these grand figures and their fiery passion. Yet the natural setting, the untamed Yorkshire moors, does seem to sympathize with and reflect their wildness, the intensity of their inner lives. Thus, Heathcliff and Catherine seem most at ease outdoors. This is where they connect most strongly. The house, *Wuthering Heights*, feels like an extension of nature. Earthy and occasionally dangerous, the Heights symbolizes the primal passions of these two restless spirits.

The restrained environment at Edgar Linton's elegant estate, Thrushcross Grange, on the other hand, nearly drives Catherine mad. We can almost feel her urgency as she lies on her deathbed yearning to break free of her stifling new home:

*Oh, I'm burning! I wish I were out of doors! I wish I were a girl again, half savage and hardy, and free; and laughing at injuries, not maddening under them! Why am I so changed? ... I'm sure I should be myself were I once among the heather on those hills. Open the window again wide.*

**Trish:** Windows appear frequently in *Wuthering Heights*. Throughout the novel, people either escape or attempt to escape through windows. Windows are also points of entry for fearful or overwhelming forces, as when Heathcliff threatens his timid wife, Edgar's sister Isabella, by trying to enter *Wuthering Heights* through the window.

## EMILY BRONTË AND 19TH-CENTURY LITERARY TRADITIONS

by Diane Clavier

With the exception of two brief stints at boarding schools and a short-lived job as a teacher, Emily Brontë led a quiet and somewhat secluded life at her home in Yorkshire. Acquaintances described her as an independent and loyal woman who enjoyed typically male pursuits like shooting. She appears to have been intensely imaginative, creating fantasy worlds into which she could withdraw for hours. Her poems reflect some of these early imaginings. Her one novel, *Wuthering Heights*, on the other hand, seems most influenced by the major literary movements of late 18th- and early 19th-century England: the gothic and the romantic.

Emily Brontë published *Wuthering Heights* in 1848 under the pseudonym "Ellis Bell." The 1850 edition included an editor's preface to the novel written by her sister Charlotte as "Currer Bell." Both Charlotte and the critics had reservations about the novel, finding its characters and subject matter a bit dark.

*Wuthering Heights*, with its dark themes and episodes, has much in common with gothic novels. This genre reached its height of popularity in the first two decades of the 19th century. A reaction to the 18th-century focus on reason and order, the gothic is characterized by irrationality and disorder. *Wuthering Heights* shares this fascination with the



But Catherine turns to windows in hopes of satisfying her restless spirit. She throws open the windows, expressing her heart's deepest wishes as she languishes at the Grange. Later, her ghost taunts Heathcliff at the window: "I couldn't lie there; for the moment I closed my eyes, she was either outside the window, or sliding back the panels, or entering the room."

**Diane:** Catherine's ghost plays a large part in the story. Brontë remains ambiguous on the question of whether she's real or imagined. But despite this supernatural dimension, the novel's characters and situations are realistic and believable. Even minor characters are fully rounded, complex people. The reserved and studious Edgar feels such a great passion for Catherine that her death destroys his health. The tough and surly Hareton, Hindley Earnshaw's abused and degraded son, reveals his gentle, inquisitive side when Catherine's grown-up daughter goes to stay at the Heights many years after her mother's death. The story itself realistically depicts frustrated desire and its aftermath—a theme common in literature precisely because it is such a persistent part of human experience.

**Trish:** In this novel, frustrations generally result from a lack of opportunities. The claustrophobic world of *Wuthering Heights* presents a clear picture of how people can be ruled by situations. This was particularly true in 19th-century rural England. Catherine and Heathcliff are intelligent, energetic people who want more than what their world has to offer. They must and do make their own opportunities. But what is available to them is ultimately unsatisfying because it is not what they really want.

Almost all of the characters, to one degree or another, suffer from the limitations of their environment. Hareton is also highly intelligent, but is forced to grow up as an uneducated farmhand. With few options beyond marriage at her disposal, Catherine's daughter, Catherine Linton, develops a foolish attachment to Heathcliff's selfish and vindictive son and escapes the consequences of the match only at Heathcliff's death.

**Diane:** Opportunities are few, but the characters often further limit themselves with bad decisions. For example, all three young women marry men whom they *know* are unsuitable. And the major plot

revolves around Heathcliff's faulty judgement. Instead of trying to convince Catherine not to marry Edgar, he runs away and plans a revenge against Hindley and Edgar, whom he blames for keeping Catherine from him. His revenge succeeds, but he never enjoys the victory. He's so haunted by memories (and maybe the ghost) of Catherine, that mere existence makes him miserable.

Although Heathcliff is undeniably interesting, I don't like him very much. He is insensitive to anything but his own obsessions and inexplicably cruel to nearly everyone except Catherine, who's far from angelic herself. For me, this mars the romantic appeal of the novel. Catherine Linton and Hareton Earnshaw are much more sympathetic characters. Thus, I especially enjoyed reading the second half of the book.

**Trish:** I found the second half of the book, which focuses primarily on Catherine Linton, much less compelling than the first half. The younger generation may be *likable*, but I doubt that readers come away from *Wuthering Heights* brooding over them. Heathcliff and Catherine, on the other hand, have inspired generations of readers and scholars to contemplate and discuss the meanings conveyed by these grand figures. Emily Brontë presents Catherine Linton and Hareton as copies of Catherine and Heathcliff. And as copies, they aren't as vigorous as the originals. They don't leave quite as strong an impression or spark our imagination in quite the same way.

**Diane:** I can't deny that Heathcliff and Catherine are more intriguing, but I also can't help asking why they die unsatisfied while the other two go on living in harmony. I'm not sure a clear answer exists. What is clear, however, is that in this novel, Brontë opens a window onto the human psyche. The feelings are real even if the consequences seem hyperbolic at times. Heathcliff's cruelty and Catherine's unremitting selfishness can be off-putting, but both are aspects of the human condition. Perhaps I find these characters both intriguing and repellent because they represent the darker side that all humans share. ■



wilder side of human experience. Other gothic conventions and themes apparent in *Wuthering Heights* include revenge, graveyard scenes, and the supernatural.

The romantic elements in *Wuthering Heights* add color to the stark outlines of its gothic framework. The romantic grew up alongside the gothic and took its place as the dominant high literary form throughout Europe in the early 19th century. Like the gothic, romanticism favors troubled heroes and focuses on the irrational aspects of human experience. Romanticism does not, however, include elements of horror, focusing instead on nature, individualism, and aesthetic experiences.

In *Wuthering Heights*, Emily Brontë powerfully combined the gothic and the romantic. Whether deliberately or unconsciously, she mingled gothic obsessions like violence and unmastered emotion with romantic ideals like courage and individuality to create a work that cannot be categorized. No other novel is quite like *Wuthering Heights*. Very few have provoked such a large number of disparate responses. But the many pages of criticism devoted to the book still leave unsolved its fundamental mysteries.

#### Upcoming Fascinating Classic:

E.M. Forster, *A Passage to India*

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*The College Review Series is intended to aid prospective college students in their search by offering insiders' views of selected colleges and universities, as expressed by current undergraduates or recent graduates who have high academic ability. Note that the number of reviewers is small. Consider their personal perspectives as only one component as you gather information and impressions from many sources.*

Our reviewers include ten students, who major(ed) in biology (2), education (1), English (4), government (1), history (2), math (1), psychology (1), and theater & speech (1). (The number of majors exceeds ten because three students have double majors.) Students' comments appear within quotation marks.

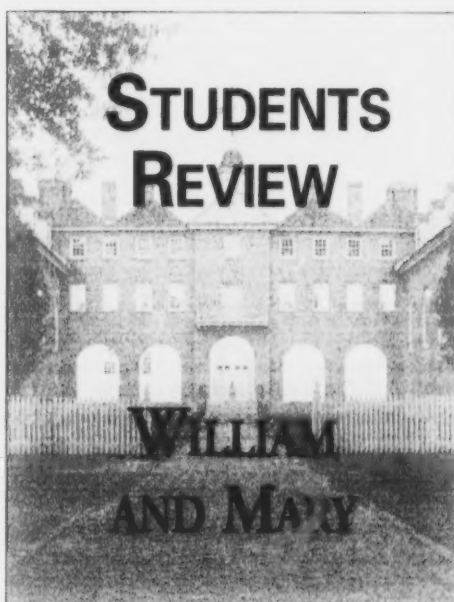
### Quality of Academic Instruction for Undergraduates

A highly selective state school smaller than some private liberal arts colleges, William and Mary consistently ranks near the top of *U.S. News & World Report's* Undergraduate Best Buys because of its combination of quality and cost. All reviewers spoke warmly of the education they received at W&M. Most also noted that grade inflation has not yet hit W&M.

"The quality of instruction here is superb. We were recently ranked #3 in the nation for quality of undergraduate instructors by *U.S. News & World Report*. The professors are very easy to get to know, if you make the effort and go to office hours or chat with them after class. Some even throw parties for their students. W&M uses very few TAs except in labs. The classes here are often small and personal, especially after the required freshman classes. All of the classes I am taking this semester have less than 30 students, and one has only 12."

"In too many universities these days, faculty are more interested in research and publishing than in teaching undergraduate courses. This is definitely not the case at W&M. Every professor I had was approachable, and quite a few took the time to get to know me outside of the classroom. By the time I graduated, I considered five or six professors to be good friends."

"Excellent. The rigorous core curriculum—one math course, two science, two social science, two world cultures, one literature, and



one creative writing or art—gives students an overview of the many interesting classes W&M has to offer and can usually be completed by the end of a student's freshman year. Grading is tough, many students go through a period of adjustment as they realize that their pond just got bigger."

"Even though W&M is a medium-sized university, it has the atmosphere of a small college. Especially in the humanities courses, you won't see much of an increase in class size from the average high school experience. Only in the intro science courses will you find lectures with several hundred people, and even these courses are not designed to weed out weaker students. The professors who teach them understand and sympathize with freshmen who are having difficulty adjusting. As for grading, it's hard to fail, but it is even harder to get an A. Making the Dean's List is quite an achievement."

"Most of my professors were very accessible, and I was particularly pleased with the helpfulness and wisdom of my academic advisor. By my junior year, I felt known, appreciated, and encouraged in my major department. Grading is tough. You have to prove yourself in almost any course you take. Although I graduated with a 3.6 average, I worried about my grades all the time, and I never took it for granted that I would excel in any course."

"My undergraduate education was conservative in the best sense. I read real books, not books about books. I went to class and discussed beauty and truth and God, and

those ideas were taken seriously. When I went on to graduate school in English, I realized that my education had been unsophisticated. I hadn't read much literary criticism and I certainly wasn't up on the latest theoretical debates. However, I now see that lack of sophistication as indicative of a strength in my education at W&M: the emphasis was on learning, not on preparing for a career."

"Academic resources could use some work. Our library is filled with books that look as if they've been there since the college was founded. The computer system is inefficient and the administration slow about ordering recent books, even when requested by a professor to do so."

### Social Life

W&M's social life, while on the tame side, was a source of pleasure to all our reviewers.

"Williamsburg is a quaint, quiet town. Both on- and off-campus, historical architecture and lovely landscapes abound. I was perfectly satisfied with my social life, though some might have considered it dull. For those who want to party, there are only the frats and three off-campus bars; but the school is small enough to make these options more than adequate. W&M is home to a lively Greek community, but you don't have to join a fraternity or sorority to have a good time. The lack of diversity is something of an issue, although I didn't notice it much at the time."

"Located in the middle of a tourist town, W&M does not have many of the hangouts commonly associated with a college town. However, there's plenty to do, and the sense of community is strong. You can easily find other students who share your interests by joining one of the fraternities, academic clubs, or organizations, such as Intervarsity (W&M has a very active religious community). I enjoyed my time at W&M and met many people with similar interests."

"Colonial Williamsburg is within easy walking distance of the dorms. The picturesque Duke of Gloucester Street is the time-honored promenade for young lovers. At times, the romantic traffic is so heavy that one expects couples to bump into each other! Another DOG Street tradition is 'Gambols,' or 18th-century pub night, when students can join in song with period-attired musicians. It made for many a memorable night."

"I loved it. There's no big city nightlife, but that was just fine for me. You'll hear people grouse about the tourists, but I loved the constant influx of people from around the world."

"The real heart of W&M's social life is the fact that so many students (nearly 80%) live on campus in college housing, which creates a friendly atmosphere. W&M feels much smaller than it is. The school and its environs feel safe."

"The atmosphere is relatively accepting and not factionalized at all. Yet it can seem bland. This reflects the conservative, somewhat conventional ethos and is exacerbated by the prevailing studiousness. Students looking for bustling social diversity may be disappointed."

"Don't expect to be chastised for spending your weekend studying. The W&M population is tolerant of people who log long hours at the library. And while the school is known for having academic pressures, they come from the students' own expectations and the lack of grade inflation. The competition isn't with other students; it's with yourself."

### **What Do You Like Best about W&M?**

Reviewers praised the strong education and the nurturing, safe learning environment.

"W&M provides a comfortable environment for students ready to ask more of themselves and investigate the liberal arts education. The education is solid and well-balanced. The relationships I formed there are definitely still the strongest in my life."

"Lifelong friendships are fostered at W&M. The studious but not competitive atmosphere, the beauty of the environment, and the idealistic approach to teaching and learning all foster the possibilities of shared growth and intimacy."

"The general academic caliber of the students made for an environment in which I thrived. Classes challenged me and brought me closer to other students. We would mull over new knowledge and chew on new bits of trivia, usually while enjoying a good meal."

"The atmosphere and the people. There's nothing quite like wandering through Williamsburg at Yuletide and watching the college president, dressed up as St. Nick, read *The Grinch Who Stole Christmas* to the student body by torchlight."

### **What Do You Like Least about W&M?**

"The provincialism and lack of diversity (although while I was there, I didn't really notice it). The student body is, on the whole, conservative and apathetic; we are the opposite of Berkeley."

"The disadvantage of a relatively small faculty is depth in fewer areas. W&M was able to provide me with a good math background and depth in a few areas of mathematics, but not nearly what a larger school would have had to offer."

"Tourists! Affectionately known as 'torons,' sightseers were known to stumble into our classes as though we were on display."

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- 4-year public coed university.
- Campus in historic Colonial Williamsburg.
- Full-time undergraduate enrollment 1998-99: 2,258 men; 3,239 women.
- Special features: Founded in 1693, W&M is the second oldest educational institution in the U.S.

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just like the stores and houses in Colonial Williamsburg."

"As a state school, W&M is subject to an ever shrinking budget, and the priority scheme is not what I would choose. Many valuable programs of study and clubs have been cut due to lack of funds, while a new baseball stadium is going up. However, I think I'd be likely to confront this problem at almost any institution."

### **Who Would Be Most Compatible with the Academic and Social Atmosphere at W&M?**

"A hard worker who wants to explore and learn and be held to a high set of standards."

Someone who relies more on friends than events to provide a satisfying social life. A party animal would get bored really fast."

"Someone who wants to study hard and to learn for learning's sake. Someone who doesn't require a socially provocative atmosphere and who appreciates tradition and heritage."

"If you can't stand tourists, don't come. And the climate is an asthmatic's nightmare—muggy, rainy, hot. Pollen literally coats everything with a yellow scum in the spring. Aside from these caveats, I think the college's liberal arts approach would appeal to almost anyone."

"The only people I can imagine not enjoying W&M are those who are ready for graduate-level courses as undergraduates. Unless the topic you wish to pursue is a faculty member's specialty, graduate-level study or research would be very difficult to pursue. I think anyone else would be very satisfied. All my friends loved W&M."

### **If You Had It to Do Over Again, Would You Go to W&M?**

All reviewers enthusiastically said yes.

"Absolutely. I emerged prepared to do things on my own and with a strong set of friends and colleagues in place. It was a unique and safe environment in which to experiment both academically and socially."

"Yes. My four years there are some of the best I ever had. Professors and friends shaped me and my interests in important ways. W&M also equipped me well for graduate school."

"In a minute, W&M was a great experience, and Williamsburg is a place you want to return to again and again."

*As you try to find the college or university best suited to you, the views of W&M presented above may be helpful. Keep in mind that these students might have had similar positive or negative experiences had they attended a different university. At any college, it is important to seek out challenging academic experiences and the best professors and to create a social life that fits your personal style.*

*Note: The students quoted in the College Review Series are expressing their own views, which are not necessarily those of JHU or IAAY.*



## PLANNING AHEAD FOR COLLEGE

### Choosing the Best College for Your Major

by Linda E. Brody, Ed.D.

*After completing a four-year degree in history at a small liberal arts college, James decided he really wanted a career in engineering. Without the background to enter graduate school in that field, he enrolled in a second undergraduate degree program at another university.*

*Steve also chose a small liberal arts college, attracted by a selective student body, small classes, and professors who value teaching. Planning to major in math, he entered college having already completed numerous math courses at a local college while in high school. He was disappointed to find few additional math offerings at the college he chose.*

*Susan enrolled as a psychology major at a prestigious university with a highly rated psychology department. It wasn't until her sophomore year that she realized the department had virtually no offerings in clinical psychology, which was her primary interest.*

*Martha entered college with no clear career goals, choosing English as her major because she enjoyed the courses. In her senior year, she decided that she wanted to pursue a career in medicine. But because she had not taken the science prerequisites necessary to apply to medical school, she had to enroll in a program where she could get the undergraduate science courses she needed.*

These students all spent a great deal of time in high school considering which college to attend. They reviewed catalogs, visited campuses, talked to other students. They chose colleges with strong academic reputations and environments where they thought they would be happy for four years. But their choices were less than optimal for their specific academic and career goals.

James and Martha entered college with no real career goals and chose their majors without giving much thought to what they would do after college. Would a different college have been better for them, given their ultimate decisions? James chose a college without an engineering program; a larger university would have given him more flexibility to change majors. Martha's college offered a fine premedical program, and she could have entered medical school as an English major if she had also taken certain science courses. Without clear career goals, both students would have been well advised to take a variety of courses in science and the humanities to keep their options open.

Susan and Steve had clear academic goals when they entered college, but they chose colleges without looking at specific departmental offerings in their areas of interest. While they each enjoyed a fine liberal arts education, they were not as prepared for graduate school in their chosen fields as they might have been if they had chosen more appropriate institutions.

### *If you're not sure about your major . . .*

You're not alone. Many students enter college uncertain about their major, and many others change their mind once they get there. You may find that a subject you loved in high school is less appealing when you begin to study it in depth, while you may become enamored of subjects you're studying for the first time in college such as medieval history or anthropology.

College is a time to explore new vistas. But you also want to be prepared when you graduate for what comes next, whether it's graduate school or work. So begin now, before college, to take the time to explore career options and to start identifying your goals.

If you do find yourself applying to college with no idea about your post-college plans, it's wise to keep your options open. If you see college as a time to explore a wide variety of subjects, while postponing career preparation until graduate school, you might choose a small liberal arts college. But if you think you might want the option of choosing a specialty major such as engineering, education, or physical therapy, you might be better served by a larger university.

### *If you are sure about your major . . .*

For any college you are considering, be sure to evaluate the strengths and specific offerings of the department in which you will major. Even highly selective colleges and universities have individual departments that are weak, or departments that are highly rated but that don't specialize in areas that match your interests.

If you want biomedical engineering, for example, don't assume that every engineering department is strong in that area. If your primary interest is creative writing, majoring in English may not give you the training you want unless there are specific courses in writing. Or, if you will enter college highly accelerated in a subject, check that the department has enough depth to provide you with courses in areas you haven't already mastered.

When looking at colleges, consider the reputation of the school, its location, cost, the characteristics of the student body, and other factors that will determine whether you will be happy there. But also consider whether the college can meet your specific academic needs, both in providing flexibility for your evolving career goals and in offering appropriate high quality course work in your major areas of interest. ■

## APPLYING TO COLLEGE?

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# THE COACH'S CORNER

## THE MANDELBROT COMPETITION

*This challenging math contest takes place in four rounds spaced throughout the school year. Each round consists of an individual round, taken by all students, and a team round, tackled by a group of four students. Schools may compete in either Division A for advanced problem solvers, Division B for less experienced competitors, or both. The 40-minute tests cover a variety of non-calculus topics; coaches receive a list of topics covered by the tests at the beginning of the year.*

*The seven individual test questions are arranged in increasing order of difficulty. Problems 1, 3, and 7 from the 1998–99 Division B Round Three Individual Test are reproduced below.*

### Problems

1. Is  $e^2 - 5e + 6$  positive, zero, or negative? Recall that  $e$ , the base for natural logarithms, is approximately 2.71828.
2. Avogadro's day is celebrated on October 23, a fact of interest chiefly to chemistry students. On what day of the week will Avogadro's day fall in the year 2023? (Note that every fourth year between now and then is a leap year, including the year 2000. Also, January 1, 1999, was a Friday.)
3. A carnival game is set up so that a ball put into play has an equally likely chance of landing in any of 60 slots at the base. The operator of the game allows you to choose a certain number of balls and put them into play. If every ball lands in a separate slot, you receive \$1 for each ball played; otherwise there is no payoff. How many balls should you choose to maximize your expected winnings?

### Solutions

1. The expression factors as  $e^2 - 5e + 6 = (e - 2)(e - 3)$ . Since  $2 < e < 3$ , the first factor is positive while the second one is negative, making the overall product negative. The arithmetically minded could have also used  $e \approx 2.7$ , which gives  $-21$  for the expression.
2. A normal year is 52 weeks and 1 day long, because  $365 = 7(52) + 1$ . Since moving forward any whole number of weeks does not affect the day of the week, advancing by one year advances the day of the week by one. (This practice of ignoring any whole multiples of 7 is known as "working modulo 7.") Similarly, advancing by a leap year, which has one extra day, advances the day of the week by two. There are 18 normal years and 6 leap years between January 1, 1999, and January 1, 2023, which means that the day of the week moves forward  $18(1) + 6(2) = 30$  times, or 4 weeks and 2 days, bringing us to a Sunday.

A quick count reveals that between January 1, 2023, and October 1, 2023, there are five months of 31 days, three with 30 days, and one with 28 days. Ignoring whole weeks gives us an increment of  $5(3) + 3(2) + 1(0) = 21$  days of the week, so October 1, 2023 is also a Sunday. Finally, we move forward 22 more days (3 weeks and 1 day), so October 23, 2023, is a Monday. By the way, Avogadro's number is  $6.023 \times 10^{23}$ , which is why it is celebrated on 10/23.

3. Suppose that we decide to deposit  $k$  balls into the game. The first ball is sure to reach an empty slot, the second one will do so with the probability  $\frac{59}{60}$ , and so on until the  $k^{\text{th}}$  ball, which misses all the others with the probability of  $\frac{60 - (k - 1)}{60}$ . The overall probability of all the balls landing in separate slots is the product of these individual factors, and since we would receive \$ $k$  for this feat, our expected winnings are  $1 \cdot \frac{59}{60} \cdot \frac{58}{60} \cdots \frac{61 - k}{60} \cdot k$ . The question on everybody's mind, of course, is could we have done better by using  $k + 1$  balls? By the same reasoning, our expected payoff will be  $1 \cdot \frac{59}{60} \cdot \frac{58}{60} \cdots \frac{61 - k}{60} \cdot \frac{60 - k}{60} \cdot (k + 1)$ , which differs from the previous result by a factor of  $\frac{60 - k}{60} \cdot \frac{k + 1}{k}$ . As long as this factor is greater than 1, it makes sense to take  $k + 1$  balls rather than  $k$ . We find that

$$\begin{aligned}\frac{60 - k}{60} \cdot \frac{k + 1}{k} &\geq 1 \\ \Leftrightarrow (60 - k)(k + 1) &\geq 60k \\ \Leftrightarrow 60 &\geq k^2 + k\end{aligned}$$

The largest  $k$  for which this holds is  $k = 7$ , so we should hold at 8 balls. In case you were wondering, the expected payoff for 8 balls is \$4.91.

Visit the Mandelbrot Web site at [www.mandelbrot.org](http://www.mandelbrot.org) for registration information, sample tests, answers to frequently asked questions, or to order *The First Five Years*, a compilation of team tests. See [www.midlevels.org](http://www.midlevels.org) to learn about the Mandelbrot Midlevel Competition for middle school students.

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More about...

### Agora

23 Across is a word you may know from psychology: "agoraphobia" is defined as "a morbid fear of open spaces." An agora was an open-air market, hence an "open space." But the

literal meaning of agoraphobia is "fear of the marketplace." Not very bullish!

# ImaGiNe...

## PRE-ALGEBRA

by Hannah Brooks-Mott

It is that sort of hard gracefulness—  
all right angles and ugly theorems—  
that he has trouble with. The quiet  
desperateness of his hand holding the pencil  
grabs at me, holds me fast  
in this world of his where equations can flip  
and twist, turning midair into something  
bigger, uglier, something almost mean.

He begins to cry once,  
shallow weeping that embarrasses me  
even as I console: *quadratics are your friends*.  
And I want it to be true, for all our sakes;  
I want him to understand the beauty of matrices,  
the sadness of inequalities. I sit with this boy for hours  
each week, holding out my knowledge to him  
in small, spare doses, ashamed when I can't answer  
the big questions,  
because really that's all he wants, all any of us  
have ever wanted. The right answers elude  
us, hide themselves completely as absolute values,  
and so we finish our problems in a flurry of sighs  
and hasty scribbles, push out an answer—wrong or right,  
we're still just solving for  $x$ .

A senior at Sun Prairie High School  
in Madison, WI, *Hannah Brooks-  
Mott* has won WCATY's Harlan O.  
Roberson poetry contest as well as  
awards in the NCTE Essay Contest  
and the Princeton University Poetry  
Contest. Hannah hopes to become  
a professional writer.

## HARBORSIDE

by Claire Whitenack

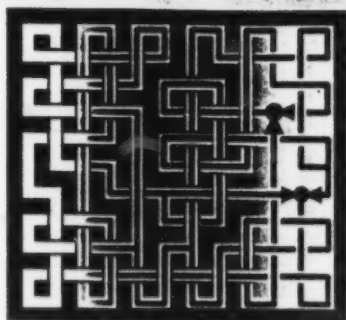
Pallid ghosts  
the gulls by the quay  
wings stirring tattered  
streamers of night  
calls shrinking into  
hungry blackness  
they watch the  
water move beneath  
the old knotted boards  
where the hooks never reach.

The eyes glitter  
restless  
in the false gold of the streetlights  
that paint glowing orchards  
of harvest moons  
to waver on the dark  
string of the harbor road.

Apart  
perched solemnly  
upon a post  
that rises from the  
shadowed depths  
to count the tides  
with a multitude of watermarks  
stands a white shape  
that in silence extends  
soft wings  
flutters, lifts to tear black  
and suddenly is gone.

*Claire Whitenack*, an eighth grader  
from Charlottesville, VA, participates  
in IAAY's Writing Tutorials. She also  
enjoys reading, particularly the works  
of her favorite poets, Federico Lorca  
and Sylvia Plath.





# Knossos Games

by Tim Boester

A first-year graduate student in mathematics at the University of Wisconsin, Tim Boester now has additional puzzles on his home page:

[www.math.wisc.edu/~boester](http://www.math.wisc.edu/~boester)



Here's a puzzle inspired by proteins that mediate transport of materials between cells.

## The Goal:

By moving the asterisk, maneuver all the filled circles into cells with vacuoles (open circles).

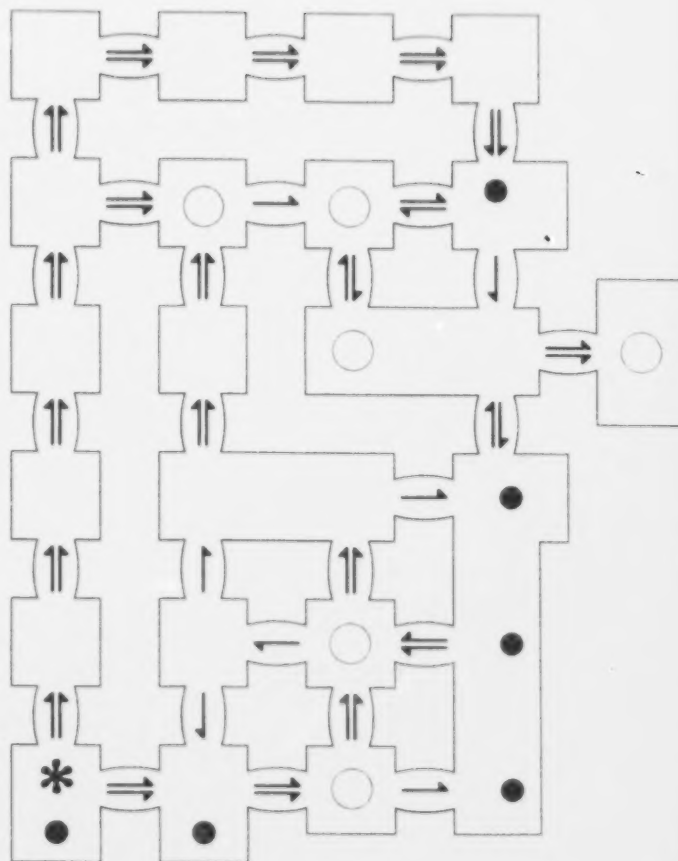
## The Rules:

You control the asterisk. The only way to move within this cellular maze is via the facilitated transport systems (arrows). Like their real-life counterparts, these transporters facilitate movement of substances according to certain rules:

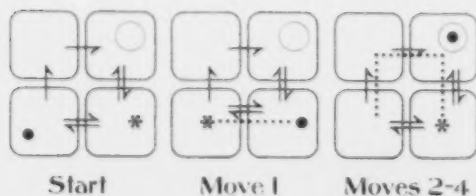
- **Uniport** systems allow one-way movement only. In the puzzle, uniporters serve as one-way doors for the asterisk.
- ⇒ **Symport** systems allow a substance to pass only if accompanied by a partner. In the puzzle, you can move using a symporter only if a filled circle moves *with* you.
- ⇌ **Antiport** systems allow a substance to enter the cell only if another leaves. In the puzzle, you can move using an antiporter only if a filled circle moves *opposite* you.
- The filled circles can only move in conjunction with the asterisk; they cannot move alone.
- Only the asterisk and filled circles move from cell to cell; the vacuoles do not move.
- Some filled circles are already in cells with vacuoles, but you may need to move them in order to get the rest of the filled circles into cells with vacuoles.

You have completed the puzzle when all the filled circles are in cells with vacuoles.

The example shows an asterisk maneuvering a filled circle into a vacuole in four moves.



## Example



Solution to Knossos Games in our March/April issue:

S: (7,4) - (7,4,8) - (7,3) - (7,3,8) - (6,3,8) - (6,2) - (6,2,7) - (6,2,5) - (5,2) - (5,2,9) - (4,2,9) - (4,2,7) - (3,2) - (3,1) - (3,0) - (0,0):F

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